



architects + engineers

## **PROJECT MANUAL**

**VAILS GATE FIRE DISTRICT  
TOWN OF NEW WINDSOR  
ORANGE COUNTY, NEW YORK**

## **NEW STORAGE BUILDING (PHASE I) NEW FIRE STATION (PHASE II)**

Project No: VGFD2001

### **BOARD OF FIRE COMMISSIONERS**

Stephen Sager, Chairman  
Paul Decker, Commissioner  
Tony DiLorenzo, Commissioner  
Sal Gigante, Commissioner  
Frank Pierri, Commissioner  
Tom Lucchesi, District Administrator  
Laurie Seymour, District Secretary  
Marie Stenglein, District Treasurer

### **ATTORNEY**

Scott Dow  
Kornfeld, Rew, Newman & Simeone, Esqs.

**JULY 2022**

**Prepared by:**

**H2M architects + engineers**  
538 Broad Hollow Road, 4<sup>th</sup> Floor East  
Melville, NY 11747  
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## PROJECT MANUAL PREFACE

**OWNER:** **Vails Gate Fire District**  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

**PROJECT:** **New Storage Building (Phase I)**  
**New Fire Station (Phase II)**  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

**INTENT:** A Project Labor Agreement (PLA) is in place for this project

**ARCHITECT:** **H2M Architects + Engineers**  
538 Broad Hollow Road  
Melville, NY 11747  
P: (516) 756-8000 E: [www.h2m.com](http://www.h2m.com)

## NOTES TO BIDDERS:

1. Work at this site consists of two phases within one set of drawings. The base bid scope in this contract will be for Phase 2 (New Firehouse) work and full site drainage, as outlined on sheet G-007.00 of the contract drawings. The contractor shall include in their bid as Add Alternate 1 (New Storage Building) all remaining work that falls within the designated Phase 1 work area as well as the phase 1 utility work area.
2. There are no "Supplementary Conditions" to the AIA documents as all modifications to AIA documents are within the documents themselves.
3. The Owner is a tax-exempt entity.
4. This is a publicly bid project.
5. Every worker employed on the project must carry on them a copy of a bona fide OSHA 10-hour safety training course completion card. All OSHA information must be delivered to the Owner prior to any worker being allowed to start any work.
6. The Owner will pay for the Building Permit. The GC will coordinate with the Owner and Architect for obtaining the permit.
7. Any other required permit, permit fee or operating fee required by the municipality, county, State of New York, Public Utility or any governing authority is the responsibility of the Respective Contractor.
8. Local, State and County fees and/or permits are in force for this project and will be obtained and paid for by the General Construction Contractor.
9. Bidders shall be required to use a surety authorized to do business in the State of New York. Said surety shall be used for all bonds required.
10. The General Contractor and all sub-contractors shall have a valid New York license applicable to their trade of work, if so required.
11. It is the responsibility of the General Contractor to forward addenda and other pertinent information to subcontractors, suppliers and vendors.
12. All questions during the bidding phase are to be posed by email to the following email address only: [kmargolies@h2m.com](mailto:kmargolies@h2m.com). The subject line should be **Vails Gate Fire District – New Storage Building (Phase I) New Fire Station (Phase II)** NO QUESTIONS WILL BE ANSWERED BY PHONE. Response will be by issuance of Addenda to address issues. Please use the email transmittal included in this manual for questions during bidding.
13. The General Construction Contractor shall be responsible for on-site coordination of work of all trades and public utilities.
14. The terms "Specifications" and "Project Manual" are the same, both referring to this document.



15. The General Contractor shall warrant its work and materials in accordance with the requirements of Section 3.5 of the A201-2007, the General Conditions of the Contract, as modified, and its subparts. All warranties shall commence on the date of Substantial Completion, as that term is defined in Section 9.8.1 of the A201-2007 and as further described in **Exhibit A** to the AIA A101-2007.
  1. Specific sections in these specifications and certain systems and materials may define a longer warranty period for materials and equipment incorporated into the work than the minimum warranty period set forth in Section 3.5 of the A201-2007.
16. Use Charges: Costs and use charges for all temporary water and electric or any other utility or temporary service are by the General Contractor (GC).
17. GC is responsible for Temporary Heat of the building until authorized use of permanent heating system. GC is responsible for scheduling, maintaining systems and all costs involved. It is the responsibility of the General Contractor to schedule the project for being weathertight within a reasonable timeframe. **No change orders for winter conditions, temporary heat or any other conditions will be allowed. All costs for temporary heat, use charges or any other cost associated with winter conditions shall be part of the base bid.**
18. All costs, requirements, permits, inspections (other than Special Inspections by the Owner) shall be borne by the General Contractor.
19. Project MEP Coordination Drawings, H2M will supply CADD backgrounds, see Electronic Files paragraph below.
  1. The Heating, Ventilating & Air Conditioning Subcontractor is to prepare and submit a set of reproducible coordination drawings showing major elements, components, and systems of mechanical and electrical equipment and materials in relationship with other building components. The Plumbing, Sprinkler and Electrical Subcontractors shall coordinate and indicate their respective work on the reproducible coordination shop drawings.
  2. Prepare floor plans, reflected ceiling plans, elevations, sections and details to conclusively coordinate and integrate all installations
  3. The General Contractor, may include this work as a line item in their Schedule of Values.
20. A final survey by the GC is required upon substantial completion.
21. Any deviation from any section of the specification requirements must be submitted in writing. A "Scope of Deviation(s)" statement is to be provided at the time a deviation(s) is requested or found. The Statement should reference the specification section and item number along with a detailed explanation of the contractor's lack of compliance, partial compliance or alternative method proposed. The absence of a "Scope of Deviation(s)" statement will hold the contractor strictly accountable to the specifications as written herein and may cause the product, system and/or submittal to be rejected as non-responsive. Also refer to Basic Product Requirements, Section 016100.
22. If the Contractors need coordinated drawings and would like Architect to create such drawing, electronic files, AutoCAD compatible drawing files, may be available from the Architect for a service fee of \$100 per set.
23. Contractor shall obtain and maintain insurance in accordance with the requirements set forth in the **Contractors Insurance and Bond Requirements**.

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**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

### **Front End Documents**

#### **Division 00 – Procurement and Contract Requirements**

Project Manual Preface  
Table of Contents  
List of Drawings  
Notice to Bidders  
Instructions for Bidders  
Contractors Insurance and Bond Requirements  
Qualifications of Bidders – NYS document CCA – 1 (05/2002)  
Certification Of Compliance with the Iran Divestment Act  
Sexual Harassment Certification  
Bidder's Proposal (PA, PB-G, PC, PD, PE)  
List of Subcontractors  
Sample Contract – AIA A101 – 2017, Standard Form of Agreement between Owner and Contractor, as Amended  
Sample GC – AIA A201 - 2017, General Conditions of the Contract for Construction, as Amended  
Sample Documents AIA G732, AIA G703, AIA G706, AIA G706A, AIA G707,  
AIA 310-2010 – Bid Bond  
AIA 312-2010 – Performance / Payment Bond

#### **Division 01 – General Requirements**

|           |                                            |
|-----------|--------------------------------------------|
| 011100    | Summary of Work                            |
| 011400    | Work Restrictions                          |
| 011419    | Site Utilization Plan                      |
| 012100    | Allowances                                 |
| 012600    | Alternates                                 |
| 012500    | Product Substitution Procedures            |
| 012900    | Payment Procedures                         |
| 012973    | Schedule of Values                         |
| 013100    | Project Management and Coordination        |
| 013119    | Progress Meetings                          |
| 013216    | Construction Schedule                      |
| 013223    | Surveying                                  |
| 013300    | Submittals                                 |
| 014100    | Regulatory Requirements                    |
| 014223    | Specification Format                       |
| 014320    | Pre-Installation Meetings                  |
| 014500    | Quality Control                            |
| 014500.11 | Statement of Special Inspections and Tests |
| 014536    | Environmental Quality Control              |
| 015000    | Temporary Facilities and Controls          |
| 015719    | Temporary Environmental Controls           |
| 016100    | Basic Product Requirements                 |
| 016500    | Product Delivery, Storage and Handling     |
| 017329    | Cutting and Patching                       |
| 017423    | Cleaning                                   |
| 017500    | Starting and Adjusting                     |

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| 017800 | Closeout Submittals                |
| 017823 | Operating and Maintenance Data     |
| 017839 | Project Record Documents           |
| 017843 | Spare Parts                        |
| 017900 | Demonstration and Training         |
| 019113 | General Commissioning Requirements |

### **Technical Specifications**

#### **Division 02 – Existing Conditions**

|        |                                           |
|--------|-------------------------------------------|
| 024119 | Selective Demolition                      |
| 028200 | Asbestos Remediation (PHASE 2- FIREHOUSE) |
| 028300 | Lead Remediation (PHASE 2- FIREHOUSE)     |

#### **Division 03 – Concrete**

|        |                                  |
|--------|----------------------------------|
| 031000 | Concrete Forming and Accessories |
| 032000 | Concrete Reinforcing             |
| 033000 | Cast in Place Concrete           |
| 033500 | Concrete Finishing               |
| 036000 | Grouting                         |

#### **Division 04 – Masonry**

|        |                                             |
|--------|---------------------------------------------|
| 040513 | Mortar                                      |
| 040523 | Masonry Accessories                         |
| 042113 | Brick Masonry                               |
| 042200 | Concrete Unit Masonry                       |
| 047200 | Cast Stone Masonry                          |
| 047313 | Calcium Silicate Manufactured Stone Masonry |

#### **Division 05 – Metals**

|           |                                              |
|-----------|----------------------------------------------|
| 051200    | Structural Steel Framing                     |
| 052100    | Steel Joist Framing (PHASE 2- FIREHOUSE)     |
| 053100    | Steel Decking                                |
| 054000    | Cold-Form Metal Framing (PHASE 2- FIREHOUSE) |
| 054400    | Cold-Form Metal Trusses (PHASE 2- FIREHOUSE) |
| 055000    | Metal Fabrications                           |
| 055100    | Metal Stairs, Handrails and Railings         |
| 055133.33 | Fixed Metal Ladders (PHASE 2- FIREHOUSE)     |

#### **Division 06 – Wood, Plastics, and Composites**

|        |                                                  |
|--------|--------------------------------------------------|
| 061000 | Rough Carpentry                                  |
| 061600 | Sheathing                                        |
| 062000 | Finish Carpentry (PHASE 2- FIREHOUSE)            |
| 064100 | Architectural Wood Casework (PHASE 2- FIREHOUSE) |
| 066000 | Plastic Fabrications (PHASE 2- FIREHOUSE)        |

#### **Division 07 – Thermal and Moisture Protection**

|        |                         |
|--------|-------------------------|
| 071113 | Bituminous Dampproofing |
| 072113 | Board Insulation        |
| 072116 | Blanket Insulation      |
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| 072713    | Air Barrier/Vapor Retarder                                                                          |
| 073113    | Asphalt Shingles (PHASE 2- FIREHOUSE)                                                               |
| 074210.31 | Composite Framing Support (CFS) System (PHASE 2- FIREHOUSE)                                         |
| 074216    | Metal Soffit Panels (PHASE 2- FIREHOUSE)                                                            |
| 075323.13 | Ethylene-Propylene-Diene-Monomer (EPDM) Roofing – Fleeceback (PHASE 2- FIREHOUSE)                   |
| 076200    | Sheet Metal Flashing and Trim                                                                       |
| 076225    | Manufactured Sheet Metal Roof Accessories – Dormers. Cupolas. Caps. And Spires (PHASE 2- FIREHOUSE) |
| 077123    | Gutters and Downspouts                                                                              |
| 077201    | Non-Penetrating Rooftop Support Systems (PHASE 2- FIREHOUSE)                                        |
| 077213    | Manufactured Curbs (PHASE 2- FIREHOUSE)                                                             |
| 077233    | Roof Hatches (PHASE 2- FIREHOUSE)                                                                   |
| 077253    | Snow Guards (PHASE 2- FIREHOUSE)                                                                    |
| 077200    | Roof Accessories – Hatches, Supports, and Curbs                                                     |
| 078100    | Applied Fireproofing (PHASE 2- FIREHOUSE)                                                           |
| 078400    | Fire Stopping (PHASE 2- FIREHOUSE)                                                                  |
| 078413    | Penetration Firestopping (PHASE 2- FIREHOUSE)                                                       |
| 079200    | Sealants                                                                                            |
| 079201    | Non Fire Rated Sleeves and Seals                                                                    |

### **Division 08 – Openings**

|           |                                                                |
|-----------|----------------------------------------------------------------|
| 080671    | Door Hardware Schedule (PHASE 1- STORAGE BUILDING)             |
| 081113    | Hollow Metal Doors and Frames                                  |
| 081429    | Pre-Finished Wood Doors (PHASE 2- FIREHOUSE)                   |
| 083113    | Access Doors and Frames (PHASE 2- FIREHOUSE)                   |
| 083613    | Sectional Overhead Doors                                       |
| 083613.11 | Sectional Overhead Doors (PHASE 2- FIREHOUSE)                  |
| 084113    | Aluminum Framed Entrances and Storefronts (PHASE 2- FIREHOUSE) |
| 085113    | Aluminum Windows (PHASE 1- STORAGE BUILDING)                   |
| 085413.11 | Fiberglass Composite Windows (PHASE 2- FIREHOUSE)              |
| 088000    | Glazing                                                        |
| 087100    | Door Hardware (PHASE 2- FIREHOUSE)                             |
| 089119    | HVAC Louvers                                                   |

### **Division 09 – Finishes**

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| 090561.13 | Moisture Vapor Emission Control                                     |
| 092216    | Non-Structural Metal Framing                                        |
| 092900    | Gypsum Board                                                        |
| 093000    | Tiling                                                              |
| 095113.11 | Suspended Acoustical Ceilings (Rockfon) (PHASE 2- FIREHOUSE)        |
| 096513    | Resilient Base and Accessories (PHASE 2- FIREHOUSE)                 |
| 096519.23 | Luxury Vinyl Tile (PHASE 2- FIREHOUSE)                              |
| 096566    | Recycled Rubber Recreational Athletic Flooring (PHASE 2- FIREHOUSE) |
| 096714    | Resinous ¼ Inch Urethane Flooring System                            |
| 097720    | Fiber Reinforced Plastic Panels (PHASE 2- FIREHOUSE)                |
| 099100    | Painting                                                            |

### **Divisions 10 – Specialties**

|           |                                                           |
|-----------|-----------------------------------------------------------|
| 101200    | Display Cases (PHASE 2- FIREHOUSE)                        |
| 101400    | Signage                                                   |
| 102113.17 | Toilet Compartments – Phenolic (PHASE 2- FIREHOUSE)       |
| 102613    | Corner Guards (PHASE 2- FIREHOUSE)                        |
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| 104313    | Defibrillator Cabinets (PHASE 2- FIREHOUSE)                      |
| 104400    | Fire Protection Specialties                                      |
| 105113    | Metal Lockers (PHASE 2- FIREHOUSE)                               |
| 105113.13 | Gear Lockers (PHASE 2- FIREHOUSE)                                |
| 107316.13 | Canopies (PHASE 2- FIREHOUSE)                                    |
| 107516    | Ground-Set Flagpole (PHASE 2- FIREHOUSE)                         |

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|           |                                                        |
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| 112173.26 | Commercial Washers and Extractors (PHASE 2- FIREHOUSE) |
| 113013.13 | Residential Kitchen Appliances (PHASE 2- FIREHOUSE)    |
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| 114000.13 | Food Service Equipment (PHASE 2- FIREHOUSE)            |

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|-----------|-----------------------------------------------------|
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| 123661.16 | Solid Surfacing Countertops (PHASE 2- FIREHOUSE)    |
| 124813    | Entrance Floor Mats and Frames (PHASE 2- FIREHOUSE) |

### **Division 13 – Special Construction**

|        |                                                    |
|--------|----------------------------------------------------|
| 133419 | Metal Building Systems (PHASE 1- STORAGE BUILDING) |
|--------|----------------------------------------------------|

### **Divisions 14 – Conveying Equipment**

|           |                                                                  |
|-----------|------------------------------------------------------------------|
| 142100.11 | Machine Room-Less Traction Elevators (Kone) (PHASE 2- FIREHOUSE) |
|-----------|------------------------------------------------------------------|

### **Divisions 15-20**

Not Used

### **Divisions 21 – Fire Suppression**

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|--------|-------------------------------------------------------------|
| 210500 | Common Work Results for Fire Suppression                    |
| 210523 | General-Duty Valves for Water-Based Fire-Suppression Piping |
| 210553 | Identification for Fire Suppression Piping and Equipment    |
| 211300 | Fire-Suppression Sprinkler Systems                          |

### **Division 22 – Plumbing**

|        |                                                        |
|--------|--------------------------------------------------------|
| 220516 | Expansion Fittings and Loop Plumbing Piping            |
| 220517 | Sleeves and Sleeve Seals for Plumbing Piping           |
| 220523 | General Duty Valves for Plumbing Piping                |
| 220529 | Hangers and Supports for Plumbing Piping and Equipment |
| 220533 | Heat Tracing for Plumbing Piping and Equipment         |
| 220553 | Identification of Plumbing Piping and Equipment        |
| 220719 | Plumbing Piping Insulation                             |
| 221005 | Plumbing Piping                                        |
| 221006 | Plumbing Piping Specialties                            |
| 221500 | General-Service Compressed Air System                  |
| 223000 | Plumbing Equipment                                     |
| 223500 | Turnkey Fuel Dispensing System Specification           |
| 224000 | Plumbing Fixtures                                      |

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| 230549    | Concrete Pads for Equipment                                                         |
| 230555    | Mechanical System Identification                                                    |
| 230594    | Balancing of Air and Hydronic Systems                                               |
| 230700    | Pipe Insulation                                                                     |
| 230719    | Ductwork Insulation                                                                 |
| 230800    | Commissioning of Mechanical Systems                                                 |
| 230923    | Automatic Temperature Controls and Building Automation System                       |
| 230991    | Instrumentation and Control Integration                                             |
| 230993    | Sequence of Operations                                                              |
| 232000    | Pipe, Valves and Fittings                                                           |
| 232001    | Condensate Drain Piping                                                             |
| 232003    | Thermometers and Pressure Gauges                                                    |
| 232006    | Hydronic Specialties                                                                |
| 232007    | Piping Specialties                                                                  |
| 232123    | Hydronic Pumps                                                                      |
| 232123.12 | High Efficiency Circulator Pumps                                                    |
| 232300    | Refrigerant Piping                                                                  |
| 233113    | Sheet Metal Work                                                                    |
| 233400    | HPLV Fans                                                                           |
| 233416    | Exhaust Fans                                                                        |
| 233700    | Air Inlets and Outlets                                                              |
| 233713    | Diffusers, Registers and Grilles                                                    |
| 233813    | Kitchen Hood Systems                                                                |
| 235133    | Prefabricated Chimneys                                                              |
| 235216    | Condensing Boilers                                                                  |
| 236002    | Boiler Room Gas Detection Systems                                                   |
| 236002.22 | Vehicle Exhaust Gas Detection System                                                |
| 237433    | Dedicated Outdoor Air Units                                                         |
| 238100    | Packaged Rooftop Units                                                              |
| 238126    | Ductless Split System Air Conditioner                                               |
| 238126.12 | Multiple Evaporator. Direct Expansion. Air-Cooled. Variable Capacity. Split Systems |
| 238216    | Coils                                                                               |
| 238219    | Fan Coil Units                                                                      |
| 238236    | Finned-Tube Radiation Heaters                                                       |
| 238239    | Electric Heaters                                                                    |
| 238239.12 | Hydronic Unit Heater                                                                |
| 238300    | Gas Fired Radiant Heaters                                                           |
| 238318    | Snow Melting System                                                                 |

## **Divisions 24-25**

Not Used

## **Division 26 – Electrical**

|        |                                                    |
|--------|----------------------------------------------------|
| 260000 | Electrical                                         |
| 260519 | Low-Voltage Electrical Power Conductors and Cables |
| 260526 | Grounding and Bonding for Electrical Systems       |
| 260529 | Hangers and Supports for Electrical Systems        |
| 260533 | Raceways and Boxes for Electrical Systems          |
| 260553 | Identification for Electrical Systems              |
| 261823 | Surge Protection                                   |
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| 262726    | Wiring Devices                                                   |
| 262816    | Enclosed Switches and Circuit Breakers                           |
| 269117    | Transfer Switch (Wall Mount) (PHASE 1- STORAGE BUILDING)         |
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| 263214    | Natural Gas Engine Generator Systems (PHASE 1- STORAGE BUILDING) |
| 263214.11 | Natural Gas Engine Generator Systems (PHASE 2- FIREHOUSE)        |
| 265000    | Lighting                                                         |
| 267173    | Electrical Utility Services                                      |
| 267174    | Temporary Electrical Utility Services and Controls               |

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Not Used

### **Division 28 – Electronic Safety and Security**

|        |                          |
|--------|--------------------------|
| 283100 | Fire Detection and Alarm |
|--------|--------------------------|

### **Divisions 29 – 30**

Not Used

### **Division 31 – Earthwork**

|        |                                   |
|--------|-----------------------------------|
| 311100 | Site Clearing                     |
| 312200 | Grading                           |
| 312316 | Excavation                        |
| 312318 | Trenching                         |
| 312323 | Fill                              |
| 314116 | Excavation Support and Protection |

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|        |                           |
|--------|---------------------------|
| 321123 | Aggregate Base Courses    |
| 321216 | Asphalt Paving            |
| 321216 | Asphaltic Concrete Paving |
| 321728 | Pavement Markings         |
| 329219 | Seeding                   |
| 329300 | Plants                    |

### **Division 33 – Utilities**

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|-----------|------------------------------------------------|
| 334413.13 | Precast Concrete Catch Basins and Field Inlets |
| 334116    | Corrugated Polyethylene Piping                 |
| 334123    | PVC Pipe                                       |
| 334913.13 | Storm Drainage Manholes                        |
| 334416    | Polymer Sloped Trench Drain Units              |

### **Informational Appendices**

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| Appendix C: | Hazardous Materials Survey |

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## LIST OF DRAWINGS



**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

### **General - Phase 1 & Phase 2**

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|          |                                                                             |
|----------|-----------------------------------------------------------------------------|
| G 000.00 | COVER SHEET                                                                 |
| G 001.00 | MASTER SHEET LIST NEW STORAGE BUILDING & NEW FIRE STATION PHASE 1 & PHASE 2 |
| G 002.00 | ARCHITECTURE GENERAL NOTES AND LEGENDS PHASE 1 & PHASE 2                    |
| G 003.00 | ARCHITECTURE GENERAL ACCESSIBILITY REQUIREMENTS PHASE 1 & PHASE 2           |
| G 004.00 | ARCHITECTURE GENERAL ACCESSIBILITY REQUIREMENTS PHASE 1 & PHASE 2           |
| G 005.00 | ARCHITECTURE GENERAL ACCESSIBILITY REQUIREMENTS PHASE 1 & PHASE 2           |
| G 006.00 | ARCHITECTURE GENERAL ACCESSIBILITY REQUIREMENTS PHASE 1 & PHASE 2           |
| G 007.00 | PHASING PLAN                                                                |

### **Civil Drawings - Phase 1 & Phase 2**

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|           |                                   |
|-----------|-----------------------------------|
| V 100.00  | EXISTING CONDITIONS PLAN          |
| CD 100.00 | DEMOLITION SITE PLAN              |
| CS 100.00 | DIMENSIONAL SITE PLAN             |
| C 100.00  | GRADING AND DRAINAGE PLAN         |
| C 110.00  | EROSION AND SEDIMENT CONTROL PLAN |
| VT 100.00 | VEHICLE TRACKING PLAN             |
| L 100.00  | LANDSCAPING AND LIGHTING PLAN     |
| C 500.00  | SITE DETAILS                      |
| C 501.00  | SITE DETAILS                      |
| C 502.00  | SITE DETAILS                      |

### **PHASE 1**

|           |                                    |
|-----------|------------------------------------|
| A1 001.00 | COVER NEW STORAGE BUILDING PHASE 1 |
|-----------|------------------------------------|

### **Structural Drawings - Phase 1**

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|           |                                                              |
|-----------|--------------------------------------------------------------|
| S1 100.00 | FOUNDATION, FIRST FLOOR SLAB, & MEZZANINE CONSTRUCTION PLANS |
| S1 500.00 | STRUCTURAL DETAILS                                           |

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|           |                                               |
|-----------|-----------------------------------------------|
| A1 010.00 | ENERGY COMPLIANCE                             |
| A1 011.00 | ENERGY COMPLIANCE                             |
| A1 012.00 | ENERGY COMPLIANCE                             |
| A1 013.00 | ENERGY COMPLIANCE                             |
| A1 014.00 | BUILDING CODE ANALYSIS & EGRESS PLAN          |
| A1 100.00 | FIRST FLOOR, ROOF PLAN AND DETAILS            |
| A1 200.00 | EXTERIOR ELEVATIONS                           |
| A1 300.00 | BUILDING SECTIONS                             |
| A1 430.00 | ENLARGED STAIR PLAN, TOILET PLAN AND SCHEDULE |
| A1 431.00 | ENLARGED DETAILS                              |
| A1 600.00 | SCHEDULES AND PARTITION TYPES                 |

### **Plumbing Drawings - Phase 1**

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|            |                                           |
|------------|-------------------------------------------|
| P1 001.00  | PLUMBING GENERAL NOTES AND LEGENDS        |
| P1 002.00  | PLUMBING SCHEDULES                        |
| PS 1100.00 | PLUMBING SITE PLAN - NEW STORAGE BUILDING |
| P1 110.00  | PLUMBING FLOOR PLAN                       |



## LIST OF DRAWINGS



**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

|           |                          |
|-----------|--------------------------|
| P1 500.00 | PLUMBING DETAILS         |
| P1 501.00 | DIESEL FUEL TANK DETAILS |
| P1 600.00 | PLUMBING RISER DIAGRAMS  |

### **Mechanical Drawings - Phase 1**

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|           |                                                 |
|-----------|-------------------------------------------------|
| M1 001.00 | MECHANICAL COVER SHEET AND NOTES                |
| M1 100.00 | FIRST FLOOR, MEZZANINE, & ROOF MECHANICAL PLANS |
| M1 510.00 | MECHANICAL DETAILS SHEET                        |
| M1 610.00 | MECHANICAL SCHEDULE SHEET                       |

### **Electrical Drawings - Phase 1**

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|           |                                                             |
|-----------|-------------------------------------------------------------|
| E1 001.00 | ELECTRICAL LEGENDS                                          |
| E1 100.00 | FIRST FLOOR & MEZZANINE ELECTRICAL LIGHTING AND POWER PLANS |
| E1 500.00 | STORAGE BUILDING ELECTRICAL DETAILS                         |
| E1 501.00 | STORAGE BUILDING ELECTRICAL DETAILS                         |
| E1 502.00 | STORAGE BUILDING ELECTRICAL GENERATOR DETAILS               |
| E1 503.00 | STORAGE BUILDING ELECTRICAL GENERATOR DETAILS               |
| E1 600.00 | STORAGE BUILDING ELECTRICAL SINGLE LINE DIAGRAM             |

### **Fire Alarm Drawings - Phase 1**

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|            |                                          |
|------------|------------------------------------------|
| FA1 001.00 | FIRE ALARM LEGEND                        |
| FA1 100.01 | FIRST FLOOR & MEZZANINE FIRE ALARM PLANS |

## **PHASE 2**

|           |                                |
|-----------|--------------------------------|
| A2 001.00 | COVER NEW FIRE STATION PHASE 2 |
|-----------|--------------------------------|

### **Structural Drawings - Phase 2**

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|           |                                                             |
|-----------|-------------------------------------------------------------|
| S2 100.00 | STRUCTURAL PARTIAL FOUNDATION PLAN AND DESIGN LOADS         |
| S2 101.00 | STRUCTURAL PARTIAL FOUNDATION PLAN - NORTH END              |
| S2 110.00 | STRUCTURAL PARTIAL SLAB PLAN - SOUTH END                    |
| S2 111.00 | STRUCTURAL PARTIAL SLAB PLAN - NORTH END                    |
| S2 120.00 | STRUCTURAL MEZZANINE FRAMING PLAN - SOUTH END               |
| S2 121.00 | STRUCTURAL SECOND FLOOR FRAMING PLAN - NORTH END            |
| S2 123.00 | STRUCTURAL PARTIAL LOW & HIGH ROOF FRAMING PLAN - SOUTH END |
| S2 124.00 | STRUCTURAL PARTIAL LOW ROOF FRAMING PLAN - NORTH END        |
| S2 125.00 | STRUCTURAL PARTIAL HIGH ROOF FRAMING PLAN - NORTH END       |
| S2 500.00 | STRUCTURAL DETAILS                                          |
| S2 501.00 | STRUCTURAL DETAILS                                          |
| S2 502.00 | STRUCTURAL DETAILS                                          |
| S2 503.00 | STRUCTURAL DETAILS                                          |
| S2 504.00 | STRUCTURAL TRUSS DETAILS                                    |
| S2 600.00 | STRUCTURAL COLUMN SCHEDULE AND DETAILS                      |

### **Architecture Drawings - Phase 2**

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|           |                                                         |
|-----------|---------------------------------------------------------|
| A2 010.00 | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2 |
| A2 011.00 | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2 |
| A2 012.00 | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2 |

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

|            |                                                                                               |
|------------|-----------------------------------------------------------------------------------------------|
| A2 013.00  | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2                                       |
| A2 014.00  | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2                                       |
| A2 015.00  | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2                                       |
| A2 016.00  | ARCHITECTURE ENERGY COMPLIANCE NEW FIRE STATION PHASE 2                                       |
| A2 020.00  | ARCHITECTURE FIRST FLOOR EGRESS PLAN NEW FIRE STATION PHASE 2                                 |
| A2 021.00  | ARCHITECTURE SECOND FLOOR EGRESS PLAN NEW FIRE STATION PHASE 2                                |
| A2 030.00  | ARCHITECTURE PARTITION TYPES, PENETRATION AND CONNECTION DETAILS<br>NEW FIRE STATION PHASE 2  |
| A2 101A.00 | ARCHITECTURE PARTIAL FIRST FLOOR PLAN NEW FIRE STATION PHASE 2                                |
| A2 101B.00 | ARCHITECTURE PARTIAL FIRST FLOOR PLAN NEW FIRE STATION PHASE 2                                |
| A2 102A.00 | ARCHITECTURE MEZZANINE FLOOR PLAN NEW FIRE STATION PHASE 2                                    |
| A2 102B.00 | ARCHITECTURE SECOND FLOOR PLAN NEW FIRE STATION PHASE 2                                       |
| A2 120A.00 | ARCHITECTURE REFLECTED CEILING PLAN PARTIAL FIRST FLOOR NEW FIRE<br>STATION PHASE 2           |
| A2 120B.00 | ARCHITECTURE REFLECTED CEILING PLAN PARTIAL FIRST FLOOR NEW FIRE<br>STATION PHASE 2           |
| A2 121A.00 | ARCHITECTURE REFLECTED CEILING PLAN MEZZANINE PLAN NEW FIRE STATION<br>PHASE 2                |
| A2 121B.00 | ARCHITECTURE REFLECTED CEILING PLAN PARTIAL SECOND FLOOR NEW FIRE<br>STATION PHASE 2          |
| A2 130A.00 | ARCHITECTURE PARTIAL ROOF PLAN NEW FIRE STATION PHASE 2                                       |
| A2 130B.00 | ARCHITECTURE PARTIAL ROOF PLAN NEW FIRE STATION PHASE 2                                       |
| A2 200.00  | ARCHITECTURE EXTERIOR BUILDING ELEVATIONS NEW FIRE STATION PHASE 2                            |
| A2 201.00  | ARCHITECTURE EXTERIOR BUILDING ELEVATIONS NEW FIRE STATION PHASE 2                            |
| A2 300.00  | ARCHITECTURE BUILDING SECTIONS NEW FIRE STATION PHASE 2                                       |
| A2 301.00  | ARCHITECTURE BUILDING SECTIONS NEW FIRE STATION PHASE 2                                       |
| A2 310.00  | ARCHITECTURE MASONRY WALL SECTIONS AND DETAILS NEW FIRE STATION<br>PHASE 2                    |
| A2 311.00  | ARCHITECTURE METAL STUD WALL SECTIONS AND DETAILS NEW FIRE STATION<br>PHASE 2                 |
| A2 410.00  | ARCHITECTURE ENLARGED TOILET PLANS, ELEVATIONS, NOTES AND DETAILS<br>NEW FIRE STATION PHASE 2 |
| A2 411.00  | ARCHITECTURE ENLARGED PLANS, INTERIOR ELEVATIONS, AND DETAILS NEW<br>FIRE STATION PHASE 2     |
| A2 412.00  | ARCHITECTURE ENLARGED PLANS AND INTERIOR ELEVATIONS NEW FIRE<br>STATION PHASE 2               |
| A2 420.00  | ARCHITECTURE ENLARGED KITCHEN PLAN NEW FIRE STATION PHASE 2                                   |
| A2 421.00  | ARCHITECTURE ENLARGED EXERCISE & COMPANY KITCHEN, NOTES & DETAILS<br>NEW FIRE STATION PHASE 2 |
| A2 430.00  | ARCHITECTURE ENLARGED STAIR PLAN AND DETAILS NEW FIRE STATION PHASE<br>2                      |
| A2 431.00  | ARCHITECTURE ENLARGED STAIR PLAN AND DETAILS NEW FIRE STATION PHASE<br>2                      |
| A2 440.00  | ARCHITECTURE ENLARGED ELEVATOR PLAN NEW FIRE STATION PHASE 2                                  |
| A2 470.00  | ARCHITECTURE ENLARGED MEZZANINE PLAN, ELEVATION, AND DETAILS NEW<br>FIRE STATION PHASE 2      |
| A2 471.00  | ARCHITECTURE MEZZANINE DETAILS AND NOTES NEW FIRE STATION PHASE 2                             |
| A2 500.00  | ARCHITECTURE WALL TRANSITION AND COLUMN DETAILS NEW FIRE STATION<br>PHASE 2                   |
| A2 501.00  | ARCHITECTURE WALL TRANSITION AND COLUMN DETAILS NEW FIRE STATION<br>PHASE 2                   |

## LIST OF DRAWINGS



**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

|           |                                                                                        |
|-----------|----------------------------------------------------------------------------------------|
| A2 510.00 | ARCHITECTURE WINDOW SCHEDULE, TYPES, DETAILS, AND NOTES NEW FIRE STATION PHASE 2       |
| A2 520.00 | ARCHITECTURE DOOR SCHEDULE, DOOR AND FRAME TYPES NEW FIRE STATION PHASE 2              |
| A2 521.00 | ARCHITECTURE DOOR DETAILS NEW FIRE STATION PHASE 2                                     |
| A2 522.00 | ARCHITECTURE DOOR DETAILS NEW FIRE STATION PHASE 2                                     |
| A2 530.00 | ARCHITECTURE CEILING AND SOFFIT DETAILS NEW FIRE STATION PHASE 2                       |
| A2 540.00 | ARCHITECTURE ROOF DETAILS NEW FIRE STATION PHASE 2                                     |
| A2 541.00 | ARCHITECTURE ROOF DETAILS NEW FIRE STATION PHASE 2                                     |
| A2 542.00 | ARCHITECTURE CANOPY DETAILS NEW FIRE STATION PHASE 2                                   |
| A2 560.00 | ARCHITECTURE MILLWORK PLANS, ELEVATIONS AND NOTES NEW FIRE STATION PHASE 2             |
| A2 600.00 | ARCHITECTURE FINISH SCHEDULE, NOTES AND DETAILS NEW FIRE STATION PHASE 2               |
| A2 610.00 | ARCHITECTURE APPARATUS BAY STRIPING PLAN AND EXTERIOR SIGNAGE NEW FIRE STATION PHASE 2 |

### **Fire Protection Drawings - Phase 2**

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|             |                                                                    |
|-------------|--------------------------------------------------------------------|
| FP2 001.00  | FIRE PROTECTION GENERAL NOTES, LEGEND, ABBREVIATIONS, AND SCHEDULE |
| FP2 100A.00 | FIRE PROTECTION PARTIAL FIRST FLOOR PLAN NEW FIRE HOUSE PHASE 2    |
| FP2 100B.00 | FIRE PROTECTION PARTIAL FIRST FLOOR PLAN NEW FIRE HOUSE PHASE 2    |
| FP2 101A.00 | FIRE PROTECTION PARTIAL SECOND FLOOR PLAN NEW FIRE HOUSE PHASE 2   |
| FP2 101B.00 | FIRE PROTECTION PARTIAL SECOND FLOOR PLAN NEW FIRE HOUSE PHASE 2   |
| FP2 102A.00 | FIRE PROTECTION PARTIAL ATTIC PLAN NEW FIRE HOUSE PHASE 2          |
| FP2 102B.00 | FIRE PROTECTION PARTIAL ATTIC PLAN NEW FIRE HOUSE PHASE 2          |
| FP2 500.00  | FIRE PROTECTION DETAILS                                            |

### **Plumbing Drawings - Phase 2**

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|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| P2 001.00  | PLUMBING NOTES, LEGEND, AND ABBREVIATIONS                                |
| P2 002.00  | PLUMBING FIXTURE SCHEDULE AND SPECIFICATIONS                             |
| P2 003.00  | PLUMBING EQUIPMENT SCHEDULE                                              |
| PS2 100.00 | PLUMBING SITE PLAN - MAIN FIRE HOUSE                                     |
| P2 120A.00 | PARTIAL DOMESTIC WATER AND GAS FIRST FLOOR PLAN NEW FIRE HOUSE PHASE 2   |
| P2 120B.00 | PARTIAL DOMESTIC WATER AND GAS FIRST FLOOR PLAN NEW FIRE HOUSE PHASE 2   |
| P2 121A.00 | PARTIAL DOMESTIC WATER AND GAS SECOND FLOOR PLAN NEW FIRE HOUSE PHASE 2  |
| P2 121B.00 | PARTIAL DOMESTIC WATER AND GAS SECOND FLOOR PLAN NEW FIRE HOUSE PHASE 2  |
| P2 130A.00 | PARTIAL SANITARY, VENT & STORM UNDERSLAB PLAN NEW FIRE HOUSE PHASE 2     |
| P2 130B.00 | PARTIAL SANITARY, VENT & STORM UNDERSLAB PLAN NEW FIRE HOUSE PHASE 2     |
| P2 131A.00 | PARTIAL SANITARY, VENT & STORM FIRST FLOOR PLAN NEW FIRE HOUSE PHASE 2   |
| P2 131B.00 | PARTIAL SANITARY, VENT & STORM FIRST FLOOR PLAN NEW FIRE HOUSE PHASE 2   |
| P2 132A.00 | PARTIAL SANITARY, VENT, & STORM SECOND FLOOR PLAN NEW FIRE HOUSE PHASE 2 |
| P2 132B.00 | PARTIAL SANITARY, VENT & STORM SECOND FLOOR PLAN NEW FIRE HOUSE PHASE 2  |
| P2 140A.00 | PLUMBING PARTIAL ROOF PLAN NEW FIRE HOUSE PHASE 2                        |

## LIST OF DRAWINGS



**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

|            |                                                               |
|------------|---------------------------------------------------------------|
| P2 140B.00 | PLUMBING PARTIAL ROOF PLAN NEW FIRE HOUSE PHASE 2             |
| P2 500.00  | PLUMBING DETAILS                                              |
| P2 501.00  | PLUMBING PLUMBING DETAILS II                                  |
| P2 600.00  | PLUMBING DOMESTIC RISER DIAGRAMS NEW FIRE HOUSE PHASE 2       |
| P2 601.00  | PLUMBING SANITARY AND VENT RISER DIAGRAM BUILDING             |
| P2 602.00  | GAS AND STORM ISOMETRIC RISER DIAGRAMS NEW FIRE HOUSE PHASE 2 |

### **Mechanical Drawings - Phase 2**

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|            |                                                         |
|------------|---------------------------------------------------------|
| M2 001.00  | HVAC LEGENDS, SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES |
| M2 100A.00 | SLAB HVAC PIPING PLAN AREA A                            |
| M2 01A.00  | FIRST FLOOR HVAC PIPING PLAN AREA A                     |
| M2 01B.00  | FIRST FLOOR HVAC PIPING PLAN AREA B                     |
| M2 102A.00 | SECOND FLOOR HVAC PIPING PLAN AREA A                    |
| M2 102B.00 | SECOND FLOOR HVAC PIPING PLAN AREA B                    |
| M2 131A.00 | FIRST FLOOR DUCTWORK PLAN AREA A                        |
| M2 131B.00 | FIRST FLOOR DUCTWORK PLAN AREA B                        |
| M2 132A.00 | SECOND FLOOR DUCTWORK PLAN AREA A                       |
| M2 132B.00 | SECOND FLOOR DUCTWORK PLAN AREA B                       |
| M2 133A.00 | HVAC ROOF PLAN AREA A                                   |
| M2 133B.00 | HVAC ROOF PLAN AREA B                                   |
| M2 401.00  | BOILER ROOM EXPANDED HVAC PIPING PLAN                   |
| M2 431.00  | BOILER ROOM EXPANDED HVAC EQUIPMENT AND DUCTWORK PLAN   |
| M2 500.00  | HVAC DETAILS (1 OF 4)                                   |
| M2 501.00  | HVAC DETAILS (2 OF 4)                                   |
| M2 502.00  | HVAC DETAILS (3 OF 4)                                   |
| M2 503.00  | HVAC DETAILS (4 OF 4)                                   |
| M2 600.00  | HVAC SCHEDULES (1 OF 3)                                 |
| M2 601.00  | HVAC SCHEDULES (2 OF 3)                                 |
| M2 602.00  | HVAC SCHEDULES (3 OF 3)                                 |
| M2 610.00  | HVAC HVAC KITCHEN SCHEDULES (1 OF 10) BUILDING          |
| M2 611.00  | HVAC KITCHEN SCHEDULES (2 OF 10)                        |
| M2 612.00  | HVAC KITCHEN SCHEDULES (3 OF 10)                        |
| M2 613.00  | HVAC KITCHEN SCHEDULES (4 OF 10)                        |
| M2 614.00  | HVAC KITCHEN SCHEDULES (5 OF 10)                        |
| M2 615.00  | HVAC HVAC KITCHEN SCHEDULES (6 OF 10) BUILDING          |
| M2 616.00  | HVAC KITCHEN SCHEDULES (7 OF 10)                        |
| M2 617.00  | HVAC KITCHEN SCHEDULES (8 OF 10)                        |
| M2 618.00  | HVAC KITCHEN SCHEDULES (9 OF 10)                        |
| M2 619.00  | HVAC KITCHEN SCHEDULES (10 OF 10)                       |
| M2 640.00  | HVAC FLOW DIAGRAM (1 of 1)                              |
| M2 650.00  | HVAC CONTROL DIAGRAM (1 of 1)                           |

### **Electrical Drawings - Phase 2**

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|            |                                                                                 |
|------------|---------------------------------------------------------------------------------|
| E2 001.00  | ELECTRICAL GENERAL NOTES AND LEGENDS NEW FIRE STATION PHASE 2                   |
| ES 100.00  | ELECTRICAL SITE PLAN                                                            |
| E2 101A.00 | PARTIAL FIRST FLOOR ELECTRICAL POWER PLAN NEW FIRE STATION PHASE 2              |
| E2 101B.00 | PARTIAL FIRST FLOOR ELECTRICAL POWER PLAN NEW FIRE STATION PHASE 2              |
| E2 102A.00 | PARTIAL SECOND / MEZZANINE FLOOR ELECTRICAL POWER PLAN NEW FIRE STATION PHASE 2 |
| E2 102B.00 | PARTIAL SECOND FLOOR ELECTRICAL POWER PLAN NEW FIRE STATION PHASE 2             |
| E2 103A.00 | PARTIAL ROOF ELECTRICAL POWER PLAN NEW FIRE STATION PHASE 2                     |

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

|            |                                                                                    |
|------------|------------------------------------------------------------------------------------|
| E2 103B.00 | PARTIAL ROOF ELECTRICAL POWER PLAN NEW FIRE STATION PHASE 2                        |
| E2 111A.00 | PARTIAL FIRST FLOOR HVAC POWER PLAN NEW FIRE STATION PHASE 2                       |
| E2 111B.00 | PARTIAL FIRST FLOOR HVAC POWER PLAN NEW FIRE STATION PHASE 2                       |
| E2 112A.00 | PARTIAL SECOND / MEZZANINE FLOOR HVAC POWER PLAN NEW FIRE STATION PHASE 2          |
| E2 112B.00 | PARTIAL SECOND FLOOR HVAC POWER PLAN NEW FIRE STATION PHASE 2                      |
| E2 114B.00 | ROOF HVAC POWER PLAN NEW FIRE STATION PHASE 2                                      |
| E2 121A.00 | PARTIAL FIRST FLOOR ELECTRICAL LIGHTING PLAN NEW FIRE STATION PHASE 2              |
| E2 121B.00 | PARTIAL FIRST FLOOR ELECTRICAL LIGHTING PLAN NEW FIRE STATION PHASE 2              |
| E2 122A.00 | PARTIAL SECOND / MEZZANINE FLOOR ELECTRICAL LIGHTING PLAN NEW FIRE STATION PHASE 2 |
| E2 122B.00 | PARTIAL SECOND FLOOR ELECTRICAL LIGHTING PLAN NEW FIRE STATION PHASE 2             |
| E2 401.00  | ELECTRICAL ENLARGE PLANS NEW FIRE STATION PHASE 2                                  |
| E2 500.00  | ELECTRICAL ELECTRICAL DETAILS BUILDING                                             |
| E2 501.00  | ELECTRICAL DETAILS                                                                 |
| E2 502.00  | ELECTRICAL GENERATOR DETAILS                                                       |
| E2 503.00  | ELECTRICAL GENERATOR DETAILS                                                       |
| E2 600.00  | ELECTRICAL SCHEDULES BUILDING                                                      |
| E2 601.00  | ELECTRICAL PANEL SCHEDULES NEW FIRE STATION PHASE 2                                |
| E2 610.00  | ELECTRICAL ELECTRICAL SINGLE LINE DIAGRAM BUILDING                                 |

**Fire Alarm Drawings - Phase 2**

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|             |                                                                           |
|-------------|---------------------------------------------------------------------------|
| FA2 001.00  | FIRE ALARM FIRE ALARM LEGENDS AND RISER DIAGRAMS BUILDING                 |
| FA2 101A.00 | PARTIAL FIRST FLOOR FIRE ALARM PLAN NEW FIRE STATION PHASE 2              |
| FA2 101B.00 | PARTIAL FIRST FLOOR FIRE ALARM PLAN NEW FIRE STATION PHASE 2              |
| FA2 102A.00 | PARTIAL SECOND / MEZZANINE FLOOR FIRE ALARM PLAN NEW FIRE STATION PHASE 2 |
| FA2 130.00  | ROOF FIRE ALARM PLAN NEW FIRE STATION PHASE 2                             |
| FA2 102B.00 | PARTIAL SECOND FLOOR FIRE ALARM PLAN NEW FIRE STATION PHASE 2             |
| FA2 130.00  | ROOF FIRE ALARM PLAN                                                      |

**END OF SECTION**

**NOTICE TO BIDDERS  
VAILS GATE FIRE DISTRICT**



Notice is hereby given that SEALED PROPOSALS for:

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

Will be received until **12:00PM prevailing time on Friday, September 2, 2022**. Coordinate drop-off of bids with Tom Lucchesi, the District Administrator, at (845)234-0966. Proposals will be opened at Station 1, located at **872 Blooming Grove Turnpike, New Windsor, New York 12553**.

Complete digital sets of Bidding Documents, Drawings and Specifications, may be obtained online as a download for **Forty Nine Dollars and 00 cents (\$49.00)** at the following website: [www.h2mprojects.com](http://www.h2mprojects.com) under 'public projects' beginning **12:00 pm** prevailing time on **Monday, July 18, 2022**.

Complete, hard copy, sets of Bidding Documents, Drawings and Specifications, may be obtained from Rev, 28 Church Street, Unit #7, Warwick, New York 10990 Tel: 1-877-272-0216, upon depositing the sum of **One Hundred Dollars and 00 cents (\$100.00)** for each set of documents. Checks or money orders shall be made payable to **VAILS GATE FIRE DISTRICT**. Plan deposit is refundable in accordance with the terms in the Instructions to Bidders to all submitting bids. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

All bid addenda will be transmitted to registered plan holders via email and will be available at [www.h2mprojects.com](http://www.h2mprojects.com). Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

Bids must be made in the standard proposal form in the manner designated therein and as required by the Specifications that must be enclosed in sealed envelopes bearing the name of the job and name and address of the bidder on the outside, addressed to: **VAILS GATE FIRE DISTRICT**, clearly marked on the outside: **Bid For: New Storage Building (Phase I) New Fire Station (Phase II)**.

Each proposal submitted must be accompanied by a certified check or bid bond, made payable to the **VAILS GATE FIRE DISTRICT**, in an amount equal to five percent (5%) of the total amount of the bid, as a commitment by the bidder that, if its bid is accepted, it will enter into a contract to perform the work and will execute such further security as may be required for the faithful performance of the contract. **Certification of bonding company is required for this bid, see Instructions for Bidders section.**

Each bidder shall agree to hold his/her bid price for forty five (45) days after the formal bid opening.

A pre-bid meeting and walk thru is scheduled for **10:00AM on Wednesday, July 27, 2022**. Potential bidders are asked to gather at the site, at which time they will be escorted to the areas of work.

It is the Board of Fire Commissioners intention to award the contracts to the lowest qualified bidder who can meet the experience, technical and budget requirements. The Board of Fire Commissioners reserves the right to reject any or all bids, waive any informality and to accept such bid which, in the opinion of the Board of Fire Commissioners, is in the best interests of the District.

Bids include all costs associated with the project. By submitting a bid, the bidder represents that they are familiar with the site and project conditions. Additionally, prior to submitting its bid, Contractor shall make Architect and Owner aware of any problems and/or inconsistencies in the bid documents.

**Vails Gate Fire District  
Board of Fire Commissioners  
Town of New Windsor**

**Issue Date: July 18, 2022**

## **INSTRUCTIONS FOR BIDDERS**



### **BIDS FOR PROJECT**

The Board of Fire Commissioners of the Vails Gate Fire District (hereafter called Owner), will receive SEALED PROPOSALS for:

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (Phase I)  
NEW FIRE STATION (Phase II)  
872 Blooming Grove Turnpike, New Windsor, NY 12553  
H2M project No.: VGFD2001**

### **TIME AND PLACE**

The sealed proposals are to be submitted to:

**Tom Lucchesi  
District Administrator  
Cell: (845)234-0966  
Email: [tlucchesi@vailsgatefd.com](mailto:tlucchesi@vailsgatefd.com)**

See Section "Notice to Bidders" of the construction documents for all dates and times.

### **REQUIRED BID SUBMISSIONS**

The following items must be submitted with Bid package:

1. Bid Bond - 5%
  - a. Or certified check in the amount of 5% of bid.
2. Certified letter from Bonding Company, indicating that they meet the minimum requirements required by the BONDS paragraph of the Contractor's Insurance & Bond Requirements.
3. Properly completed proposal forms (P-sheets) and list of subcontractors (SCL).
4. Certified letter that the company bidding this project has been in business under the same name for a period of five years or longer, and is not currently disbarred from bidding or working on public works projects by the New York State Department of Labor

### **ENVELOPES**

All proposals must be submitted in a sealed envelope, with the following items clearly and legibly labeled on the exterior: Contractors name, project name as it appears above, and the contract(s) for which the bid is being submitted. Inside of this sealed envelope shall be the Proposal Sheets PA-PE fully and legibly completed. A second envelope marked "QUALIFICATIONS," shall also be inserted and shall contain all the documents hereafter designated under REQUIRED BID SUBMISSION.

### **QUALIFICATIONS OF BIDDERS**

In the consideration and acceptance of any proposal, the Board of Fire Commissioners shall be entitled to exercise every measure of lawful discretion evaluating the financial history and ability of the Bidder and its past performance in ventures of this or similar nature. Such data will be considered either as a material or controlling factor in the acceptance of any bid submitted.

Bidders must prove to the satisfaction of the Board of Fire Commissioners that they are reputable, reliable and responsible.



## INSTRUCTIONS FOR BIDDERS



Bidders shall enclose in the envelope marked "QUALIFICATIONS" references and a notarized letter stating that a responsible representative of the Contractor's office visited the site to verify the scope of work.

Verified statement of the following items should also be provided in this envelope with respect to five (5) projects of similar nature (a minimum of one (1) project must be an emergency services facility i.e., Firehouse, Ambulance Facility or Police Station) and comparable scope in Orange County, which have been successfully completed by the bidder and have been in operation for a period of not less than one (1) year:

- (a) general project description;
- (b) location of work;
- (c) date of award;
- (d) date of completion;
- (e) contract amount;
- (f) client for whom work was performed; and
- (g) name, title and telephone number of individuals who may be contacted for references.

In addition to the above specified information required to be submitted with the bid, the Board of Fire Commissioners may request such other information as it deems necessary to provide either an approval or disapproval of the Bidder, which may include (but not be limited to) the following:

- (a) Provide a list of similar data on projects awarded to the Bidder, but not yet completed.
- (b) A current financial statement of assets of the Bidder, duly signed and notarized.
- (c) Names and addresses of all company officers, length of time company has been in business and field experience of officers, foremen, etc.
- (d) A list of equipment available.
- (e) Schedule of Values
- (f) Project Schedule
- (g) List of Product Manufacturers

The Board of Fire Commissioners may make any investigation it deems necessary to assure itself of the ability of the Bidder to perform the work.

The Board of Fire Commissioners reserves the right to reject any or all proposals and to accept the Proposal it deems most advantageous to the Board of Fire Commissioners, even though it may not be the lowest bid received.

### **VERBAL ANSWERS**

The **Owner**, its agents, servants, employees and the Architect/Engineer shall not be responsible in any manner for **verbal** answers to inquiries made regarding the meaning of the drawings or the specifications prior to the awarding of the contract.

For information with reference to the work and its location during bid phase by prospective bidders' questions shall be submitted in writing to:

**H2M architects + engineers**  
**Katie Margolies, RA**  
**230 West 38<sup>th</sup> Street, 14<sup>th</sup> Floor**  
**New York, NY 10018**



## INSTRUCTIONS FOR BIDDERS



Phone: (646) 518-6300 Ext. 1307  
e-mail: [kmargolies@h2m.com](mailto:kmargolies@h2m.com)

To be given consideration, questions must be received by Friday, August 19, 2022 at 12PM.

### **ADDENDA AND INTERPRETATIONS**

No interpretations of the meaning of the plans, specifications or other Contract Documents will be made to any bidder orally. Every request for such interpretation should be made in writing, addressed to:

**H2M architects + engineers**  
**Katie Margolies, RA**  
**230 West 38<sup>th</sup> Street, 14<sup>th</sup> Floor**  
**New York, NY 10018**

Phone: (646) 518-6300 Ext. 1307  
e-mail: [kmargolies@h2m.com](mailto:kmargolies@h2m.com)

To be given consideration, questions must be received at least ten (10) days prior to the date fixed for the opening of bids. Any and all interpretations and any supplement instructions will be in the form of written addenda to the specifications and will be sent by mail or faxed to each of the Contractors who have taken out the Drawings and Contract Documents.

All addenda so issued shall become part of the Contract Documents. If any addenda may materially affect the bid, the District may extend the bid date.

### **PRE-BID INSPECTION OF SITE**

Each bidder shall conduct on-site inspections of the referenced project sites during the pre-bid walkthrough prior to submission of a bid proposal. The bidder shall acquaint himself/herself with all apparent conditions and characteristics of the facility with regard to assessment of required materials quantities, evaluation of quality of existing materials, access to the site and equipment's, location of underground utilities, clearances and all related information necessary to develop an understanding of the required scope of the work and all field conditions. Bidders must satisfy themselves by personal examination of the location of the proposed work and of the actual conditions and requirements of the work and shall not, at any time after the submission of the Proposal, dispute or complain of such estimate or assert there was any misunderstanding in regard to the depth or character or the nature of the work to be done. No consideration will be given for subsequent additional claims by the contractor of award after bidding with regard to apparent field conditions.

### **PRE-BID CONFERENCE**

See Section "Notice to Bidders"

### **BIDDER TO BE FAMILIAR WITH PLANS AND REQUIREMENTS**

It is the bidder's responsibility to examine carefully the plans and specifications, proposal and the site upon which the work is to be performed. A proposal submitted shall be prima facie evidence that the bidder has made such examination and that he/she is familiar with all of the conditions and requirements.

### **PREPARATION OF PROPOSAL**

The Proposal forms PA-PE contained herein must be used in preparing bids. Failure to use said Proposal forms or the inclusion of bids not requested may result in rejection of the bid.

## INSTRUCTIONS FOR BIDDERS



No proposal shall be received by the **Owner** unless the bidder tendering same is known to be skilled in work of a similar nature to that envisaged in the Proposal.

Each bidder shall fill out in ink (**in both words and figures**) and signed by an officer of the corporation in the spaces provided, lump sum bid, as the case may be, for each item in the Proposal. If there is a discrepancy between the prices in words and figures, the prices in words shall govern as unit and lump sum prices.

**No bid will be considered which does not include bids for all items listed in the Proposal.**

If the contract is not awarded by the **Owner** and/or the balance of funds due is not placed in escrow by the **Owner** within 90 days of receipt of bids, the obligation of the bidder under its Proposal may terminate at its option, and it shall thereupon be entitled to a refund of its certified check or release of the bid bond furnished as security with its Proposal.

### **NAME OF BIDDER**

Each bidder must state in the Proposal its full name and business address, and the full name of every person, firm or corporation interested therein and the address of every person or firm, or president and secretary of every corporation interested with it; if no other person, firm or corporation be so interested, it must affirmatively state such fact. The Bidder must also state that the Proposal is made without any connection (directly or indirectly) with any other bidder for the work mentioned in its proposal and is (in all respects) without fraud or collusion; it has inspected the site of the work, has examined the Contract, General Conditions, Specifications, Plans, all addenda, and Information for Bidders; no person acting for or employed by the **Owner** is directly or indirectly interested therein, or in the supplies or work to which it relates or in any portion of the prospective profits thereof; it proposes and agrees if its proposal or bid is accepted, to execute a contract with the VAILS GATE FIRE DISTRICT to perform the work mentioned in the contract, plans and specifications attached; and the amount it will accept in full payment.

### **CERTIFIED CHECK OR BID BOND/BONDING CERTIFICATION**

Each bid must be accompanied by either a certified check drawn on a solvent bank with an office in the State of New York, or a bid bond equal to five percent (5 %) of the total amount payable to the VAILS GATE FIRE DISTRICT. This amount shall be the measure of liquidated damage sustained by the Owner as a result of the failure, negligence or refusal of the Bidder to whom the contract is awarded to execute and deliver the contract.

All bonding companies supplying bid, performance and maintenance bonds are required to provide with the bid package the following required information. Bidders failing to provide this information will not be considered. Provide a certified statement that the bonding company meets or exceeds the following:

1. A.M. Best Company (Old Wick, New Jersey) Rating of A (very good) or better.
2. (FPR) Financial Performance Rating from A.M. Best of not less than 6.
3. Bonding company must be registered to do business in New York State.
4. Listed in the U.S. Treasury Circular 570 (1994 version).
5. If underwriting limitation is less than the required performance bond amount, then the excess amount must be protected by co-insurance with a company meeting the same standards as above.

**PERMITS AND REGULATIONS**

Each Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. Each Contractor is required to observe all laws and ordinances relating to the obstructing of streets, maintaining signals, keeping open passageways and protecting them where exposed to danger, and all general ordinances affecting him, his employees, or his work hereunder in his relations to the Owner or any person. Each contractor also to obey all laws and ordinances controlling or limiting the Contractor while engaged in the prosecution of the work under this Contract.

If the Contractor observes that the drawings and specifications are at variance with laws and regulations, he/she shall promptly notify the Architect in writing and any necessary changes shall be adjusted as provided in the contract for changes in the work. If the Contractor performs any work knowing it be contrary to such laws, ordinances, rules, regulations, or specifications, or local, state or federal authorities without such notice to the Architect, he/she bear all costs arising there-from.

**CONTRACTORS UNDERSTANDING**

It is understood and agreed that the Contractor has, by careful examination, satisfied himself/herself as to the nature and location of the Work, and conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this contract.

No official, officer, or agent of the Owner is authorized to make any representations as to the materials or workmanship involved or the conditions to be encountered and the Contractor agrees that no such statement or the evidence of any documents or plans, not a part of this contract, shall constitute any grounds for claim as to conditions encountered. No verbal agreement or conversation with any officer, agent, or employee of the Owner either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

It is understood and agreed that the Contractor has informed himself fully as to the conditions relating to construction and labor under which the work will be performed and agrees as far as possible to employ such methods and means in the performance of his work so as not to cause interruption or interference with any other Contractor.

**EQUIVALENTS**

In the Specifications, two or more kinds, types, brands, or manufacturers or materials are regarded as the required standard of quality and are presumed to be equal. The contractor may select one of these items or, if the contractor desires to use any kind type, brand, or manufacturer or material other than those named in the specifications, they shall indicate in writing when requested, and prior to award of contract, what kind, type, brand or manufacturer is included in the base bid for the specified item.

Submission for equivalents shall be submitted to the Architect prior to the award of the contract.

**BID EVALUATION**

The Owner and Architect may make such investigation as they necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish the Owner with all such additional information and

data for this purpose as may be requested. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

**NOTICE OF ACCEPTANCE**

The **Owner** shall give notice of acceptance of a bid by mail, sent within ninety (90) days after the bids have been opened.

**SIGNING OF CONTRACT**

Each Bidder to whom a contract is awarded, together with the sureties offered by him, shall attend at the office of the **Owner** within ten (10) business days after the date of notification by mail of acceptance of its Proposal, and shall there sign the contract for the work and furnish the approved security in an amount equal to the full amount of the contract for its performance and maintenance.

**INSURANCE**

The amounts, types and clauses to be included in the insurance is required to be carried by the successful bidder and its contractors, are listed as outlined in the Contractors Insurance & Bond Requirements section of these front end documents.

**WAIVER OF IMMUNITY**

Attention is directed to the statement of non-collusion required by Article 5A of the "General Municipal Law of the State of New York" concerning Waiver of Immunity and included in the attached Agreement.

**NON-COLLUSION**

"a. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

1. The prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and
3. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition."

"b. A bid shall not be considered for award nor shall any award be made where items a. 1, 2 and 3 above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where items a. 1, 2 and 3 above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

## INSTRUCTIONS FOR BIDDERS



The fact that a bidder: (a) has published price lists, rates or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of Subparagraph a. 1."

"c. Any bid hereafter made to any political subdivision of the State or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed, or goods sold or to be sold; where competitive bidding is required by statute, rule, regulation or local law, and where such bid contains the certification referred to in Subdivision 1 of this section, shall be deemed to have been authorized by the Board of Directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of the certificate as to non-collusion as the act and deed of the corporation."

### **RESPONSIBILITY OF BIDDER**

The attention of Bidders is directed particularly to the contract provisions whereby the Contractor will be responsible for any loss or damage that may occur to the work or any part thereof during its progress and whereby the Contractor must make good any defects or faults in the work that may occur during the progress or within two (2) years after final payment is issued by the owner.

**Contractor shall provide for the continuation of the Performance Bond as a Maintenance Bond for two (2) full years after date of final payment request at the full final contract price.**

The work is to be performed and completed to the satisfaction of the Architect/Engineer and in substantial accordance with the specifications annexed hereto and the plans referred to therein.

### **LABOR RATES**

See Appendix B: Project Labor Agreement

VAILS GATE FIRE DISTRICT  
BOARD OF FIRE COMMISSIONERS

In public work contracts or service contracts, where not otherwise noted in the specifications, contractors shall provide insurance coverage as follows:

The contractor shall not commence work under this contract until he/she has obtained and has been approved by the Vails Gate Fire District, the insurance required under this contract, as enumerated herein and by an insurance company authorized to do business in the State of New York with the Best rating of at least A. Premiums for such insurance shall be an expense of the contractor unless otherwise explicitly stated herein.

1) Workers' Compensation

- (a) State Statutory
- (b) Applicable Federal Statutory
- (c) Employer Liability
- (d) Benefits required by Union labor contracts as applicable
- (e) If employees are brought into New York from another state or the insured is based within another state, the insured must provide proof that New York is a listed State within section 3A of the workers compensation coverage.
- (f) Leased Employee Liability – if contractor leases one or more employees through the use of payroll, employee management or other company, the contractor must directly procure Workers Compensation/Employers Liability insurance in the name of the entity holding this Agreement. In addition, the Workers Compensation/Employers Liability coverage to and for the leased employees provided by Leasing company must be evidence and include an Alternative Employer/Leased Employee endorsement, naming the Contractor as the alternate employer
- (g) Provide form C105.2 as evidence of coverage

**Waiver of subrogation required in favor of the indemnified parties.**

2) Comprehensive General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage including, explosion, collapse and underground property damage. Coverage shall contain a per project aggregate.)

(a) Commercial General Liability

- \$1,000,000 Each Occurrence
- \$2,000,000 Aggregates-General or Products/Completed Operations

Contractor shall maintain the required coverage for itself, indemnified parties and additional insureds for 2 years after final acceptance of the Owner.

Coverage shall be primary/non-contributory for the additional insured and include a waiver of subrogation in favor of the additional insureds.

Contractual Liability coverage must be included providing insurance for all indemnified parties and additional insureds required by the contract.

Coverage shall not contain a limitation or exclusion of coverage for (a) injury to employees of the Contractor ( b) Limitation or Exclusion of # of Stories that contractor can work at as it relates to the Project; c) Subsidence d) Cross Suits exclusion ( Insured vs Insured) e) New York State Labor Law exclusions.

Indemnified Parties shall be named as Additional Insured using additional insured endorsement CG 2010 11/85 (a combination of ISO CG 2010 07/04, ISO CG 2038 04/13 and ISO CG 2037 07/04 may be used) to reflect coverage for ongoing and

completed operations.

Coverage limits required by this contract may be satisfied through the combination of General Liability and Umbrella/Excess coverages, Thus, in the event that coverage obtained by the Contractor contains greater limits than the minimum limits required above, the indemnified parties and additional insureds shall be entitled to such greater limits, and this Agreement shall be deemed to require greater limits.

- (b) Comprehensive Automotive –  
 \$1,000,000 Combined Single Limit  
 \$1,000,000 Hired and Non-Owned

Auto Liability must name indemnified parties and additional insureds using ISO CA 2048 or equivalent endorsement.

Coverage must contain a waiver of subrogation in favor of the indemnified parties and additional insureds.

- (c) Excess Umbrella Liability

\$5,000,000 Per Occurrence and Aggregate  
 \$10,000 Self-Insured Retention

- (d) Owner's protective liability insurance.

\$1,000,000 Each Occurrence  
 \$2,000,000 Aggregate

1. The Indemnitees (as defined in the Agreement) must each be included as additional insureds.
2. Umbrella coverage provided by the Contractor for the additional insured shall be primary over any insurance maintained by the additional insured
3. Coverage provided cannot contain any limitation or exclusion related to the following: (a) Residential Construction that would relate to the Project; (b) Limitation or Exclusion of # of Stories that contractor can work at as it relates to the Project; (c) Subsidence; (d) "Action Over" – injury to employees, subcontractors, casual and temporary labor; and (e) "Hammer Clause" – coverage subject to certain policy provisions
4. If coverage is provided on an excess basis, coverage must follow form to the underlying General Liability and Commercial Automobile coverages.
5. Contractor shall maintain umbrella coverage for itself, indemnified parties and additional insureds including Completed Operation Coverage for 2 years after the completion of Work.

- 3.) Property Insurance:

Contractor is required to provide insurance to protect their respective interests in construction/building materials and supplies, tools and equipment while on or off the jobsite. Owner is not responsible for any loss (i.e. fire, destruction, theft), of Contractors/Sub-contractors property or equipment.

- (a) Builders Risk 100% construction replacement cost throughout the course of the entire contract until final appearance. Contractor shall be responsible for deductibles applicable to the Builders Risk coverage.

Waiver of Subrogation must be provided in favor of the indemnified parties and additional insureds on General Liability, Auto, Workers Compensation and Umbrella.



SUBCONTRACTORS

- 1) Workers' Compensation
  - (a) State Statutory
  - (b) Applicable Federal Statutory
  - (c) Employer Liability
  - (d) Benefits required by Union labor contracts as applicable
  - (e) If employees are brought into New York from another state or the insured is based within another state, the insured must provide proof that New York is a listed State within section 3A of the workers compensation coverage.
  - (f) Leased Employee Liability – if contractor leases one or more employees through the use of payroll, employee management or other company, the contractor must directly procure Workers Compensation/Employers Liability insurance in the name of the entity holding this Agreement. In addition, the Workers Compensation/Employers Liability coverage to and for the leased employees provided by Leasing company must be evidence and include an Alternative Employer/Leased Employee endorsement, naming the Contractor as the alternate employer

**Waiver of subrogation required in favor of the indemnified parties.**

- 2) Comprehensive General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage including, explosion, collapse and underground property damage. Coverage shall contain a per project aggregate.)

- (a) Commercial General Liability

|             |                                                     |
|-------------|-----------------------------------------------------|
| \$1,000,000 | Each Occurrence                                     |
| \$2,000,000 | Aggregates-General or Products/Completed Operations |

Contractor shall maintain the required coverage for itself, indemnified parties and additional insureds for 2 years after final acceptance of the Owner.

Coverage shall be primary/non-contributory for the additional insured and include a waiver of subrogation in favor of the additional insureds.

Contractual Liability coverage must be included providing insurance for all indemnified parties and additional insureds required by the contract.

Coverage shall not contain a limitation or exclusion of coverage for (a) injury to employees of the Contractor ( b) Limitation or Exclusion of # of Stories that contractor can work at as it relates to the Project; c) Subsidence d) Cross Suits exclusion ( Insured vs Insured).

Indemnified Parties shall be named as Additional Insured using additional insured endorsement CG 2010 11/85 (a combination of ISO CG 2010 07/04, ISO CG 2038 04/13 and ISO CG 2037 07/04 may be used) to reflect coverage for ongoing and completed operations.

Coverage limits required by this contract may be satisfied through the combination of General Liability and Umbrella/Excess coverages, Thus, in the event that coverage obtained by the Contractor contains greater limits that the minimum limits required above, the indemnified parties and additional insureds shall be entitled to such greater limits, and this Agreement shall be deemed to require greater limits.



- (b) Comprehensive Automotive –  
 \$1,000,000 Combined Single Limit  
 \$1,000,000 Hired and Non-Owned

Auto Liability must name indemnified parties and additional insureds using ISO CA 2048 or equivalent endorsement.

Coverage must contain a waiver of subrogation in favor of the indemnified parties and additional insureds.

- (c) Excess Umbrella Liability  
 \$5,000,000 Per Occurrence and Aggregate  
 \$10,000 Self-Insured Retention

1. The Indemnitees (as defined in the Agreement) must each be included as additional insureds.
2. Umbrella coverage provided by the Contractor for the additional insured shall be primary over any insurance maintained by the additional insured
3. Coverage provided cannot contain any limitation or exclusion related to the following: (a) Residential Construction that would relate to the Project; (b) Limitation or Exclusion of # of Stories that contractor can work at as it relates to the Project; (c) Subsidence; (d) "Action Over" – injury to employees, subcontractors, casual and temporary labor; and (e) "Hammer Clause" – coverage subject to certain policy provisions
4. If coverage is provided on an excess basis, coverage must follow form to the underlying General Liability and Commercial Automobile coverages.
5. Contractor shall maintain umbrella coverage for itself, indemnified parties and additional insureds including Completed Operation Coverage for 2 years after the completion of Work.

Contractor is required to have an executed contract with each subcontractor that contains an indemnification agreement and insurance requirements. The insurance requirements must require that the Contractor, Owner(s) indemnified parties and additional insureds required by this rider be named as additional insured on a primary/noncontributory basis including completed operations.

## BONDS

**Company must be New York State licensed and approved by owner.**

- |    |                                                             |                                                              |
|----|-------------------------------------------------------------|--------------------------------------------------------------|
| 1) | Bid Bond –                                                  | Minimum of 5% of contract bid.                               |
| 2) | Performance Bond &<br>Labor and material<br>Payment Bonds - | 125% of contract bid for period of construction.             |
| 3) | Maintenance Bond-                                           | 100% of contract price for two years after final completion. |

ADDITIONAL INSUREDS: The following shall be named as additional insureds on all policies, naming same as a “Certificate Holder” will not satisfy this requirement.

- 1) Vails Gate Fire District  
Board of Fire Commissioners  
PO Box 188  
Vails Gate, New York  
12584
- 2) Vails Gate Fire Company. Inc.  
PO Box 101  
Vails Gate, New York  
12584
- 3) H2M architects + engineers  
538 Broad Hollow Road, 4th Floor East  
Melville, New York 11747

### **Qualifications of Bidders**

The Owner may make such investigations as the Owner deems necessary to determine the responsibility of any Bidder or to determine the ability of any Bidder to perform the Work. Bidders shall furnish to the Owner all information and data required by the Owner, including complete financial data, within the time and in the form and manner required by the Owner. The Owner reserves the right to reject any bid if the evidence required by the Owner is not submitted as required or if the evidence submitted by or the investigation of any Bidder fails to satisfy the Owner that the Bidder is responsible, or is able or qualified to carry out the obligations of the Contract or to complete the Work as contemplated.

**AT THE DISCRETION OF THE OWNER, THE BIDDER MAY BE REQUIRED TO COMPLETE AND SUBMIT THE NEW YORK STATE UNIFORM CONTRACTING QUESTIONNAIRE AFTER RECEIPT OF BIDS, TO ASSIST IN DETERMINING THE BIDDER'S QUALIFICATIONS.**

## INSTRUCTIONS

**NOTE:** Please indicate whether you believe that any of the information supplied herein is confidential and should be exempt from disclosure under the Freedom of Information Law:   yes  ,   no  . If you checked "yes" you must identify the information you feel is confidential by placing an asterisk in front of the appropriate question number(s) and you are requested to attach an additional sheet(s) upon which the basis for such claim(s) is explained.

## GENERAL INFORMATION

E-MAIL ADDRESS

5. ARE YOU CERTIFIED AS A DBE MBE WBE IF SO, WITH WHOM?

## OWNERSHIP, MANAGEMENT, AFFILIATION

6. Identify each person who is, or has been within the past five years, an owner of 5.0% or more of the firm's shares, or one of the five largest shareholders or a director, an officer, a partner or a proprietor. Joint ventures: provide information for all firms involved. Fill in name, % owned, office held; indicate by Y or N whether director, officer or partner:

[illegible]

7. Identify any other firms in which, now or in the past five years, the firm or any of the individuals listed in question six above, either owned or owns 5.0% or more of the shares of, or was or is one of the five largest shareholders or as a director, officer, partner or proprietor of said other firm:

| FEDERAL ID NO. | % OWNED | FIRM/COMPANY NAME | FIRM/COMPANY ADDRESS |
|----------------|---------|-------------------|----------------------|
|                |         |                   |                      |
|                |         |                   |                      |
|                |         |                   |                      |
|                |         |                   |                      |
|                |         |                   |                      |

8. Identify any affiliate not listed in your answers to questions 6 and 7. For purposes of this question your firm and another are affiliates when, either directly or indirectly, one controls or has the power to control the other, or a third party or parties controls, or has the power to control both:

| FEDERAL ID NO. | COMPANY NAME | ADDRESS |
|----------------|--------------|---------|
|                |              |         |
|                |              |         |
|                |              |         |
|                |              |         |
|                |              |         |

9. Identify any and all shareholders, directors, officers, owners, partners, or proprietors in common between your firm and any firm listed in response to questions 6,7 or 8:

| FEDERAL ID NO. | FIRST NAME, MI & LAST NAME | POSITION | OTHER FIRM |
|----------------|----------------------------|----------|------------|
|                |                            |          |            |
|                |                            |          |            |
|                |                            |          |            |
|                |                            |          |            |
|                |                            |          |            |

10. List the ten most recent contracts the firm has completed. If less than ten, include most recent subcontracts on projects up to that number:

| AGENCY/OWNER, CONTACT PERSON & TELEPHONE NO. | CONTRACT NO. | PRIME OR SUB | DESIGN ARCHITECT AND/OR DESIGN ENGINEER | AWARD DATE | AMOUNT | DATE COMPLETED |
|----------------------------------------------|--------------|--------------|-----------------------------------------|------------|--------|----------------|
| 1.                                           |              |              |                                         |            |        |                |
| 2.                                           |              |              |                                         |            |        |                |
| 3.                                           |              |              |                                         |            |        |                |
| 4.                                           |              |              |                                         |            |        |                |
| 5.                                           |              |              |                                         |            |        |                |
| 6.                                           |              |              |                                         |            |        |                |
| 7.                                           |              |              |                                         |            |        |                |
| 8.                                           |              |              |                                         |            |        |                |
| 9.                                           |              |              |                                         |            |        |                |
| 10.                                          |              |              |                                         |            |        |                |

11. List all current uncompleted construction contracts:

| AGENCY/OWNER, CONTACT PERSON & TELEPHONE NO. | CONTRACT NO. | PRIME OR SUB | DESIGN ARCHITECT AND/OR DESIGN ENGINEER | TOTAL \$ AMOUNT OF FIRM'S CONTRACT (OR SUBCONTRACT) | \$ AMOUNT SUBLET TO OTHERS | UNCOMPLETED \$ AMOUNT OF FIRM'S CONTRACT (OR SUBCONTRACT) |
|----------------------------------------------|--------------|--------------|-----------------------------------------|-----------------------------------------------------|----------------------------|-----------------------------------------------------------|
|                                              |              |              |                                         |                                                     |                            |                                                           |
|                                              |              |              |                                         |                                                     |                            |                                                           |
|                                              |              |              |                                         |                                                     |                            |                                                           |
|                                              |              |              |                                         |                                                     |                            |                                                           |
|                                              |              |              |                                         |                                                     |                            |                                                           |

GRAND TOTAL: \_\_\_\_\_

12. Gross Sales for Firm's Previous 3 Fiscal Years:
- | <u>YEAR</u> |          | <u>YEAR</u> |          |
|-------------|----------|-------------|----------|
| _____       | \$ _____ | _____       | \$ _____ |
| _____       | \$ _____ | _____       | \$ _____ |
| _____       | \$ _____ | _____       | \$ _____ |

Average Backlog for Firm's Previous 3 Fiscal Years:  
(Estimated total value of uncompleted work on outstanding contracts)

13. Has the firm, or any firm listed in response to questions 6, 7 or 8, defaulted or been terminated on, or had its surety called upon to complete, any contract awarded within the past five years? NO { } YES { } If, yes, give date(s), agency(ies)/owner(s), project(s), contract numbers, and describe including the result: \_\_\_\_\_
14. For all contracts within the past five years: (a) list and describe all liens or claims over \$25,000 filed against the firm and remaining undischarged or unsatisfied for more than 90 days; and (b) list and describe all liquidated damages assessed \_\_\_\_\_

#### FINANCIAL INFORMATION

15. Complete the attached financial statement or attach a copy of the firm's most recent annual financial statement and accompanying notes.

#### OTHER INFORMATION

16. Within the past five years has the firm, any affiliate, any predecessor company or entity, or any person identified in question number 6 above been the subject of any of the following: (respond to each question and describe in detail the circumstances of each affirmative answer; attach additional pages if necessary)
- |                                                                                                                                                                                      |      |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|
| (a) a judgment of conviction for any business-related conduct constituting a crime under state or federal law?                                                                       | no__ | yes__ |
| (b) a criminal investigation or indictment for any business-related conduct constituting a crime under state or federal law?                                                         | no__ | yes__ |
| (c) a grant of immunity for any business-related conduct constituting a crime under state or federal law?                                                                            | no__ | yes__ |
| (d) a federal or state suspension or debarment?                                                                                                                                      | no__ | yes__ |
| (e) a rejection of any bid for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?                                 | no__ | yes__ |
| (f) a rejection of any proposed subcontract for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?                | no__ | yes__ |
| (g) a denial or revocation of prequalification?                                                                                                                                      | no__ | yes__ |
| (h) a voluntary exclusion from bidding/contracting agreement?                                                                                                                        | no__ | yes__ |
| (i) any administrative proceeding or civil action seeking specific performance or restitution in connection with any public works contract except any disputed work proceeding?      | no__ | yes__ |
| (j) an OSHA Citation and Notification of Penalty containing a violation classified as serious?                                                                                       | no__ | yes__ |
| (k) an OSHA Citation and Notification of Penalty containing a violation classified as willful?                                                                                       | no__ | yes__ |
| (l) a prevailing wage or supplement payment violation?                                                                                                                               | no__ | yes__ |
| (m) a State Labor Law violation deemed willful?                                                                                                                                      | no__ | yes__ |
| (n) any other federal or state citations, Notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation? | no__ | yes__ |

- (o) any criminal investigation, felony indictment or conviction concerning formation of, or any business association with, an allegedly false or fraudulent women's, minority or disadvantaged business enterprise? no\_\_ yes\_\_
- (p) any denial, decertification, revocation or forfeiture of Women's Business Enterprise, Minority Business Enterprise or Disadvantaged Business Enterprise status? no\_\_ yes\_\_
- (q) rejection of a low bid on a State contract for failure to meet statutory affirmative action or M/WBE requirements? no\_\_ yes\_\_
- (r) a consent order with the NYS Department of Environmental Conservation, or a federal, state or local government enforcement determination involving a violation of federal or state environmental laws? no\_\_ yes\_\_
- (s) any bankruptcy proceeding? no\_\_ yes\_\_
- (t) any suspension or revocation of any business or professional license? no\_\_ yes\_\_
- (u) any citations, Notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of:
- \* federal, state or local health laws, rules or regulations no\_\_ yes\_\_
  - \* federal, state or local environmental laws, rules or regulations no\_\_ yes\_\_
  - \* unemployment insurance or workers compensation coverage or claim requirements no\_\_ yes\_\_
  - \* ERISA (Employee Retirement Income Security Act) no\_\_ yes\_\_
  - \* federal, state or local human rights laws no\_\_ yes\_\_
  - \* federal or state security laws? no\_\_ yes\_\_
- (v) a request to withdraw a bid submitted to a public owner or any claim of an error on a bid submitted to a public owner? no\_\_ yes\_\_

**CERTIFICATION**

The undersigned recognizes that this questionnaire is submitted for the express purpose of inducing the State of New York or its agencies and instrumentalities to award a contract, or approve a subcontract; acknowledges that the State or its agencies and instrumentalities may in its discretion, by means which it may choose, determine the truth and accuracy of all statements made herein; acknowledges that intentional submission of false or misleading information may constitute a felony under Penal Law §210.40 or a misdemeanor under Penal Law §210.35 or §210.45, and may also be punishable by a fine of up to \$10,000 or imprisonment of up to five years under 18 U.S.C. §1001; and states that the information submitted in this questionnaire and any attached pages is true, accurate and complete.

Sworn to before me this

\_\_\_\_\_ day of \_\_\_\_\_,

\_\_\_\_\_  
Signature of Officer

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
Title

\_\_\_\_\_  
Commission Expiration Date

\_\_\_\_\_  
Officer Name (Please Print)



As of (date): \_\_\_\_\_

**ASSETS****Current Assets**

- |                                                                          |          |          |
|--------------------------------------------------------------------------|----------|----------|
| 1. Cash                                                                  |          | \$ _____ |
| 2. Accounts receivable - less allowance for doubtful accounts            |          | _____    |
| Retainers included in accounts receivable                                | \$ _____ |          |
| Claims included in accounts receivable not yet approved or in litigation | _____    |          |
| 3. Notes receivable - due within one year                                |          | _____    |
| 4. Inventory - materials                                                 |          | _____    |
| 5. Contract costs in excess of billings on uncompleted contracts         |          | _____    |
| 6. Accrued income receivable                                             |          |          |
| Interest                                                                 | _____    |          |
| Other (list) _____                                                       | _____    |          |
| _____                                                                    | _____    |          |
| Total accrued income receivable                                          |          | _____    |
| 7. Deposits                                                              |          |          |
| Bid and plan _____                                                       | _____    |          |
| Other (list) _____                                                       | _____    |          |
| _____                                                                    | _____    |          |
| Total deposits                                                           |          | _____    |
| 8. Prepaid Expenses                                                      |          |          |
| Income Taxes                                                             | _____    |          |
| Insurance                                                                | _____    |          |
| Other (list) _____                                                       | _____    |          |
| _____                                                                    | _____    |          |
| Total prepaid expenses                                                   |          | _____    |
| 9. Other current Assets                                                  |          |          |
| (list) _____                                                             | _____    |          |
| _____                                                                    | _____    |          |
| Total other current assets                                               |          | _____    |
| 10. Total Current Assets                                                 |          | _____    |
| 11. <b><u>Investments</u></b>                                            |          |          |
| Listed securities-present market value                                   | _____    |          |
| Unlisted securities-present value                                        | _____    |          |
| Total investments                                                        |          | _____    |
| 12. Fixed Assets                                                         |          |          |
| Land                                                                     | _____    |          |
| Building and improvements                                                | _____    |          |
| Leasehold Improvements                                                   | _____    |          |
| Machinery and equipment                                                  | _____    |          |

12. Fixed Assets (Continued)

Automotive equipment \_\_\_\_\_

Office furniture and fixtures \_\_\_\_\_

Other (list) \_\_\_\_\_

\_\_\_\_\_  
Total \_\_\_\_\_

Less: accumulated depreciation \_\_\_\_\_

Total fixed assets - net \_\_\_\_\_

13. Other Assets

Loans receivable - officers \_\_\_\_\_

- employees \_\_\_\_\_

- shareholders \_\_\_\_\_

Cash surrender value of officers' life insurance \_\_\_\_\_

Organization expense - net of amortization \_\_\_\_\_

Notes receivable - due after one year \_\_\_\_\_

Other (list) \_\_\_\_\_

\_\_\_\_\_  
Total other assets \_\_\_\_\_

## 14. TOTAL ASSETS \_\_\_\_\_

**LIABILITIES****Current Liabilities**

|                                                        |          |          |
|--------------------------------------------------------|----------|----------|
| 15. Accounts payable                                   |          | \$ _____ |
| 16. Loans from shareholders - due within one year      |          | _____    |
| 17. Notes payable - due within one year                |          | _____    |
| 18. Mortgage payable - due within one year             |          | _____    |
| 19. Other payables - due within one year               |          |          |
| (list) _____                                           | \$ _____ |          |
| _____                                                  | _____    |          |
| Total other payables - due within one year             |          | _____    |
| 20. Billings in excess of costs and estimated earnings |          | _____    |
| 21. Accrued expenses payable - salaries and wages      | _____    |          |
| - payroll taxes                                        | _____    |          |
| - employees' benefits                                  | _____    |          |
| - insurance                                            | _____    |          |
| - other                                                | _____    |          |
| Total accrued expenses payable                         |          | _____    |
| 22. Dividends payable                                  |          | _____    |
| 23. Income taxes payable - state                       | _____    |          |
| - federal                                              | _____    |          |
| - other                                                | _____    |          |
| Total income taxes payable                             |          | _____    |
| 24. Total Current Liabilities                          |          | _____    |
| 25. <u>Deferred Income Taxes Payable</u> - state       | _____    |          |
| - federal                                              | _____    |          |
| - other                                                | _____    |          |
| Total deferred income taxes                            |          | _____    |
| 26. <u>Long Term Liabilities</u>                       |          |          |
| Loans from shareholders - due after one year           | _____    |          |
| Notes payable - due after one year                     | _____    |          |
| Mortgage - due after one year                          | _____    |          |
| Other payables - due after one year                    | _____    |          |
| (list) _____                                           | _____    |          |
| _____                                                  | _____    |          |
| Total long term liabilities                            |          | _____    |
| 27. <u>Other Liabilities</u>                           |          |          |
| (list) _____                                           | _____    |          |
| _____                                                  | _____    |          |
| Total other liabilities                                |          | _____    |
| 28. TOTAL LIABILITIES                                  |          | _____    |

**NET WORTH**

29. Net Worth (if proprietorship or partnership)

\$ \_\_\_\_\_

30. Stockholders' Equity

Common stock issued and outstanding

\_\_\_\_\_

Preferred stock issued and outstanding

\_\_\_\_\_

Retaining earnings

\_\_\_\_\_

Total

\_\_\_\_\_

Less: Treasury stock

\_\_\_\_\_

31. TOTAL STOCKHOLDERS' EQUITY

\_\_\_\_\_

32. TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY

=====

**NOTE: IF ADDITIONAL SPACE IS REQUIRED, PLEASE NOTE AND ATTACH SCHEDULE TO STATEMENT**

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Name of OrganizationBy: \_\_\_\_\_  
Signature and Title\_\_\_\_\_  
Name (please print)

**CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT**

As a result of the Iran Divestment Act of 2012 (the "Act"), Chapter 1 of the 2012 Laws of New York, a new provision has been added to State Finance Law (SFL) § 165-a and New York General Municipal Law § 103-g, both effective April 12, 2012. Under the Act, the Commissioner of the Office of General Services (OGS) will be developing a list of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law) (the "Prohibited Entities List"). Pursuant to SFL § 165-a(3)(b), the initial list is expected to be issued no later than 120 days after the Act's effective date at which time it will be posted on the OGS website.

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, each Bidder/Contractor, any person signing on behalf of any Bidder/Contractor and any assignee or subcontractor and, in the case of a joint bid, each party thereto, certifies, under penalty of perjury, that once the Prohibited Entities List is posted on the OGS website, that to the best of its knowledge and belief, that each Bidder/Contractor and any subcontractor or assignee is not identified on the Prohibited Entities List created pursuant to SFL § 165-a(3)(b).

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS Website, any Bidder/Contractor seeking to renew or extend a Contract or assume the responsibility of a Contract awarded in response to this solicitation must certify at the time the Contract is renewed, extended or assigned that it is not included on the Prohibited Entities List.

During the term of the Contract, should the Fire District receive information that a Bidder/Contractor is in violation of the above-referenced certification, the Fire District will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the Fire District shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default. The Fire District reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I, \_\_\_\_\_, being duly sworn, deposes and says that he/she is the \_\_\_\_\_ of the \_\_\_\_\_ Corporation and that neither the Bidder/ Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

\_\_\_\_\_  
SIGNED

SWORN to before me this

\_\_\_\_\_ day of \_\_\_\_\_

202\_\_\_\_

Notary Public: \_\_\_\_\_

## SEXUAL HARASSMENT CERTIFICATION

The following certification must be submitted with all bids submitted after January 1, 2019 pursuant to N.Y. State Finance Law § 139-1(1)(a).

"By submission of this bid/proposal, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that the bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all of its employees. Such policy shall, at a minimum, meet the requirements of section two hundred one-g of the labor law."

Dated: \_\_\_\_\_

\_\_\_\_\_  
(Signature Here)

\_\_\_\_\_  
(Signatory's Name Printed)

\_\_\_\_\_  
(Name of Bidder)

**PROPOSAL:  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)**



**Contract G – General Construction Work**

To: Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

For the furnishing and installing of materials for all work included under contract as follows:

Made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by

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**Bidders Declaration:**

The party named as Bidder declares that the only person or persons interested in this bid or proposal as principal or principals is or are named herein; and that no other person than herein named has any interest in this proposal or in the contract proposed to be taken; that this bid or proposal is made without any connections with any other person and persons making a bid or proposal for the same purpose; that the bid or proposal is in all respects fair and without collusion or fraud; that it has examined the site of the work, the contract and specifications and the drawings referred to; and has read the Information for Bidders hereto attached; and it proposes and agrees, if this proposal is accepted, it will contract in the form as approved to perform all the work mentioned in said contract and specifications; and it will accept in full payment therefor the following sums to wit:

**PROPOSAL: CONTRACT G - GENERAL CONSTRUCTION WORK**

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
New Windsor, NY 12553**



**BID DATE: JULY 18, 2022**

**BASE BID (Phase 2)**

**Note: The bidder is asked to use either black ink or typewriter (black ribbon) in completing this proposal form. All cost shall include labor and materials to complete the work as described in drawings and specifications.**

|                                                                                         |       |
|-----------------------------------------------------------------------------------------|-------|
| ITEM 1 – DIVISION 1 – GENERAL REQUIREMENTS<br>(Written in Words):                       | (\$ ) |
| ITEM 2 – DIVISION 1 – BONDS AND INSURANCE<br>(Written in Words):                        | (\$ ) |
| ITEM 3 – DIVISION 2 – SELECTIVE DEMOLITION<br>(Written in Words):                       | (\$ ) |
| ITEM 4 – DIVISION 3 – CONCRETE<br>(Written in Words):                                   | (\$ ) |
| ITEM 5 – DIVISION 4 – MASONRY<br>(Written in Words):                                    | (\$ ) |
| ITEM 6 – DIVISION 5 – METALS<br>(Written in Words):                                     | (\$ ) |
| ITEM 7 – DIVISION 6 – WOOD PLASTIC AND COMPOSITES<br>(Written in Words):                | (\$ ) |
| ITEM 8 – DIVISION 7 – THERMAL AND MOISTURE PROTECTION<br>(Written in Words):            | (\$ ) |
| ITEM 9 – DIVISION 8 – OPENINGS<br>(Written in Words):                                   | (\$ ) |
| ITEM 10 – DIVISION 9 – FINISHES<br>(Written in Words):                                  | (\$ ) |
| ITEM 11 – DIVISION 10 – SPECIALTIES<br>(Written in Words):                              | (\$ ) |
| ITEM 12 – DIVISION 11 – EQUIPMENT<br>(Written in Words):                                | (\$ ) |
| ITEM 13 – DIVISION 12 – FURNISHINGS<br>(Written in Words):                              | (\$ ) |
| ITEM 14 – DIVISION 13 – SPECIAL CONSTRUCTION<br>(Written in Words):                     | (\$ ) |
| ITEM 15 – DIVISION 14 – CONVEYING EQUIPMENT<br>(Written in Words):                      | (\$ ) |
| ITEM 16 – DIVISION 21 – FIRE SUPPRESSION<br>(Written in Words):                         | (\$ ) |
| ITEM 17 – DIVISION 22 – PLUMBING<br>(Written in Words):                                 | (\$ ) |
| ITEM 18 – DIVISION 23 – HEATING VENTILATION AND AIR-CONDITIONING<br>(Written in Words): | (\$ ) |
| ITEM 19 – DIVISION 26 – ELECTRICAL<br>(Written in Words):                               | (\$ ) |
| ITEM 20 – DIVISION 28 – ELECTRONIC SAFETY AND SECURITY<br>(Written in Words):           | (\$ ) |
| ITEM 21 – DIVISION 31 – EARTHWORK<br>(Written in Words):                                | (\$ ) |
| ITEM 22 – DIVISION 32– EXTERIOR IMPROVEMENTS<br>(Written in Words):                     | (\$ ) |



**PROPOSAL: CONTRACT G - GENERAL CONSTRUCTION WORK**

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
New Windsor, NY 12553**



**BID DATE: JULY 18, 2022**

|                                                                                                                 |                   |
|-----------------------------------------------------------------------------------------------------------------|-------------------|
| ITEM 23 – DIVISION 33 – UTILITIES<br>(Written in Words):                                                        | (\$ )             |
| ITEM 24 – DIVISION 1 – TESTING ALLOWANCE<br>(Written in Words): FIFTEEN THOUSAND DOLLARS and 00 CENTS           | (\$ \$15,000.00 ) |
| ITEM 25 – DIVISION 1 – MISCELLANEOUS ALLOWANCE<br>(Written in Words): TWO HUNDRED THOUSAND DOLLARS and 00 CENTS | (\$ 200,000.00 )  |
| ITEM 26 – DIVISION 1 – UTILITY ALLOWANCE<br>(Written in Words): SEVENTY FIVE THOUSAND DOLLARS and 00 CENTS      | (\$ 75,000.00 )   |
| ITEM 27 – DIVISION 1 – PROJECT CLOSEOUT<br>(Written in Words):                                                  | (\$ )             |
| ITEM 28 - DIVISION 1 – PROJECT RECORD DOCUMENTS<br>(Written in Words):                                          | (\$ )             |
| <b>TOTAL BASE BID (INCLUDING ITEMS 1 THRU 28)</b><br>(Written in Words):                                        | <b>(\$ )</b>      |

|                                                                  |              |
|------------------------------------------------------------------|--------------|
| <b>TOTAL BID INCLUDING ADD ALTERNATES</b><br>(Written in Words): | <b>(\$ )</b> |
|------------------------------------------------------------------|--------------|

**ALTERNATES**

The contractor shall clearly state whether cost indicated is to be added to or deleted from the base bid cost. Failure to clearly state same will be grounds for disqualification of the bidder.

**All work included under this heading shall be subject to the general conditions of the project. All construction, workmanship and finishes required by the alternates shall be as specified in the applicable sections of the specifications manual.**

The undersigned proposes and agrees that should the following alternates be accepted and included in the contract, the awarded contract amount will include the TOTAL BASE BID plus or minus the selected ALTERNATES.

The undersigned further agrees that should the following Alternates be accepted, the alternate bid prices indicated shall be held and honored for a period of six months from the date of contract signing, or installation date of base bid items, whichever occurs first.

The Owner may, at their discretion, select any combination of alternates.

**Note: The bidder is asked to use either black ink or typewriter (black ribbon) in completing this proposal form. Each line item amount must be completed. Failure to do so will be grounds for disqualification of the bidder.**

|                                                                                                                                                   |       |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| <b><u>ADD ALTERNATE 1 (Phase 1)</u></b>                                                                                                           |       |
| <u>Description:</u> All work in Phase 1 (U.N.O.): Storage building including associated site work, utility connections and building construction. |       |
| ITEM A1 – DIVISION 1 – GENERAL REQUIREMENTS<br>(Written in Words):                                                                                | (\$ ) |
| ITEM A2 – DIVISION 1 – BONDS AND INSURANCE<br>(Written in Words):                                                                                 | (\$ ) |
| ITEM A3 – DIVISION 2 – SELECTIVE DEMOLITION                                                                                                       |       |

**PROPOSAL: CONTRACT G - GENERAL CONSTRUCTION WORK**

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
New Windsor, NY 12553**



**BID DATE: JULY 18, 2022**

|                                                            |              |
|------------------------------------------------------------|--------------|
| (Written in Words):                                        | (\$ )        |
| ITEM A4 – DIVISION 3 – CONCRETE                            |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A5 – DIVISION 4 – MASONRY                             |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A6 – DIVISION 5 – METALS                              |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A7 – DIVISION 6 – WOOD PLASTIC AND COMPOSITES         |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A8 – DIVISION 7 – THERMAL AND MOISTURE PROTECTION     |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A9 – DIVISION 8 – OPENINGS                            |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A10 – DIVISION 9 – FINISHES                           |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A11 – DIVISION 10 – SPECIALTIES                       |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A12 – DIVISION 13 – SPECIAL CONSTRUCTION              |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A13 – DIVISION 22 – PLUMBING                          |              |
| (Written in Words):                                        | (\$ )        |
| ITEM 14 – DIVISION 26 – ELECTRICAL                         |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A15 – DIVISION 28 – ELECTRONIC SAFETY AND SECURITY    |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A16 – DIVISION 31 – EARTHWORK                         |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A17 – DIVISION 32– EXTERIOR IMPROVEMENTS              |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A18 – DIVISION 33 – UTILITIES                         |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A19 – DIVISION 1 – PROJECT CLOSEOUT                   |              |
| (Written in Words):                                        | (\$ )        |
| ITEM A20 – DIVISION 1 – PROJECT RECORD DOCUMENTS           |              |
| (Written in Words):                                        | (\$ )        |
| <b>TOTAL ADD ALTERNATE 1 (INCLUDING ITEMS A1 THRU A20)</b> |              |
| <b>(Written in Words):</b>                                 | <b>(\$ )</b> |

| <b>ADD ALTERNATES 2 - 4</b> |                                                                                                                               |      |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|------|
| Contract-Number             | Description of Alternate                                                                                                      | Cost |
| Add Alternate #2            | Provide fully tiled walls in kitchen 118, in lieu of FRP panels.                                                              | \$   |
| Add Alternate #3            | Provide porcelain pavers in lieu of luxury vinyl flooring throughout meeting room 116, approximately 2,995 sf.                | \$   |
| Add Alternate #4            | Provide 4x12 tile above 2x8 accent tile in lieu of paint for men's toilet 127, women's toilet 128, and bathrooms 208 and 209. | \$   |

**PROPOSAL: CONTRACT G - GENERAL CONSTRUCTION WORK**

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
New Windsor, NY 12553**



**BID DATE: JULY 18, 2022**

**Note: The VAILS GATE FIRE DISTRICT is exempt from Federal, New York State and local taxes. TOTAL AMOUNT OF BID shall be exclusive of all taxes.**

**ADDENDUM**

The undersigned hereby acknowledges receipt of the following addenda (if applicable):

| <b>Addendum #</b> | <b>Date</b> | <b>Received by:</b> | <b>Reviewed &amp; Incorporated into Bid by:</b> |
|-------------------|-------------|---------------------|-------------------------------------------------|
| _____             | _____       | _____               | _____                                           |
| _____             | _____       | _____               | _____                                           |

The bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that the bid shall be good and may not be withdrawn for a period of **FORTY FIVE (45)** calendar days after the scheduled closing time for receiving bids.

The Contractor is required to visit the site for a field survey to verify the scope of work prior to bid submission. The Contractor certifies that he has previously submitted all requests for substitutions of other brands or products not listed in the specifications and received Architects/Engineers approval on all substituted products being used for this project.

**The Board of Commissioners of the Vails Gate Fire District reserves the right to award this contract to other than the low bidder.**

The General Contractor is to provide full time site supervision for his or her staff, subcontractors and suppliers for the duration of this project. A qualified site supervisor must have the authority to represent and make decisions for his or her company with regards to the subject job, must be able to give guidance and direction to employees, subcontractors and suppliers, and must be knowledgeable about the work to be provided. **Site supervisor must be capable of effectively communicating with the District and/or Architect, preferably able to speak fluently in English.** Failure to provide a qualified site supervisor at the job site shall subject said General Contractor to a penalty of \$500 per day for every occurrence.

**Time being of the essence of this contract and the time limit established herein for the completion of the work being of importance, in the event of failure to complete the work in this manner and within:**

- a. Six hundred and Twenty (620) calendar days (if Add Alternate 1 is awarded);**
- b. Or, Four hundred and Twenty (420) calendar days (if Add Alternate 1 is NOT awarded);**

**from notice to proceed, or within the time granted in any extension thereof, the Contractor agrees that the Owner may, and it is hereby authorized to deduct and retain from the monies due or to become due the Contractor under these Contract Documents, the sum of Five Hundred Dollars (\$500) per day for each and every day beyond the completion date fixed, which amount is hereby agreed upon, fixed and determined by the parties hereto as the liquidated damages, and not as a penalty that the Owner shall suffer by reason of said delay, due in part or in full for any additional inspection costs, loss of revenue or other costs to the Owner.**

**It is the Contractor's responsibility to complete this project within the time period specified in this Contract. In the event that the Contractor fails to complete the project within the stated time period and the Owner, at its sole discretion, deems it necessary for the Architect to provide services beyond the Contract completion date, the cost of said services will be deducted from payments due the Contractor.**

**In the event that the amount owed the Contractor is less than the cost of the additional services provided by the Architect, then the Architect will be paid the funds held by the Owner plus the**

**PROPOSAL: CONTRACT G - GENERAL CONSTRUCTION WORK**

**VAILS GATE FIRE DISTRICT  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)  
New Windsor, NY 12553**



**BID DATE: JULY 18, 2022**

**differential cost of said services, which shall be deemed a claim against the Payment Bond provided by the Contractor. It shall be the obligation of the Bonding Company to pay the differential costs within ten (10) days of notification by the Owner. Failure to pay these costs within ten (10) days of notification shall be considered a default.**

**Bidder:** \_\_\_\_\_

**Bidder Address:** \_\_\_\_\_

**Signed By:** \_\_\_\_\_ **Title:** \_\_\_\_\_

**Date:** \_\_\_\_\_

Provide telephone number where the Contractor or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but not later than **Twenty Four (24)** hours:

**DAY:** ( ) \_\_\_\_\_ **NIGHT:** ( ) \_\_\_\_\_

**FAX:** ( ) \_\_\_\_\_

**Federal I.D. No. or Social Security No. :** \_\_\_\_\_

**PROPOSAL:  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)**



Enclosed in the bid package is a certified check or bid bond for five percent (5%) of the total amount of each of the projects bids as required by the foregoing "Information for Bidders."

The Bidder hereby agrees to appear with its sureties at the office of the Owner within ten (10) business days after due notice from the Owner that the contract has been awarded to it and is ready for signature. Such notice is to be given in writing within Ninety (90) days of opening of the bids. On the signing of such contract by the Bidder, the bidder hereby agrees to furnish the indemnifying bonds as provided in the General Conditions.

The Bidder hereby further agrees that in the event of its failure or refusal to enter into a contract in accordance with this bid within ten (10) business days after due notice from the Owner the contract has been awarded to it and is ready for signature, as given in accordance with the Information for Bidders and/or its failure to execute and deliver the bond for the full amount of the contract price, as provided in said Information for Bidders, the Bidder's check or bid bond which is herewith deposited with the Owner shall (at the option of said Owner) become due and payable as ascertained and liquidated damages for such default; otherwise, said check or bid bond will be returned to the undersigned.

The full names and residences of all persons and parties interested in the foregoing bid as principals are as follows:

| Name  | Address |
|-------|---------|
| <hr/> | <hr/>   |
| <hr/> | <hr/>   |
| <hr/> | <hr/>   |

**Name of Bidder:** \_\_\_\_\_

**Business Address of Bidder:** \_\_\_\_\_

\_\_\_\_\_

**PROPOSAL:  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)**



**NON-COLLUSIVE BIDDING CERTIFICATE**

Pursuant to Section 103-D of the General Municipal Law, the Contractor makes the following statement under penalty of perjury, and by submission of this bid or proposal, the bidder certified that:

(a) This bid or proposal has been independently arrived at without collusion with any other bidder or with any competitor or potential competitor; (b) this bid or proposal has not been knowingly disclosed and will not be knowingly disclosed prior to the opening of the bids or proposals for this project to any other bidder, competitor or potential competitor; (c) no attempt has been or will be made to induce any other person, partnership or corporation to submit or not to submit a bid or proposal; (d) the person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification and, under penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf; (e) that attached hereto (if a corporate bidder) is a certified copy of resolution authorizing the execution of this certificate by the signatory of this bid or proposal on behalf of the corporate bidder.

Resolve that \_\_\_\_\_ be authorized to sign  
*Name of Corporation*

and submit the bid or proposal of this corporation for the following project:

\_\_\_\_\_  
*Describe Project*

and to include in such bid or proposal the certificate as to non-collusion required by Section 103-D of the General Municipal Law as the act and deed of such corporation, and for any inaccuracies or misstatements in such certificate, this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution adopted by \_\_\_\_\_  
\_\_\_\_\_ at a meeting of its Board of Directors held on the \_\_\_\_\_ day of \_\_\_\_\_  
\_\_\_\_\_, 20\_\_\_\_.

(Seal of the Corporation)

Secretary: \_\_\_\_\_

RESPECTIVELY SUBMITTED:

Firm Name: \_\_\_\_\_

Address: \_\_\_\_\_

Signed By: \_\_\_\_\_

Title: \_\_\_\_\_

**PROPOSAL:  
NEW STORAGE BUILDING (PHASE I)  
NEW FIRE STATION (PHASE II)**



**HOLD HARMLESS AGREEMENT**

In accordance with article 12 of the general conditions, indemnification, the contractor will be required to sign the following "hold harmless" agreement with the Vails Gate Fire District and the Vails Gate Fire Company, Inc. Compliance with the foregoing requirements for insurance shall not relieve the contractor from liability set forth under the indemnity agreement.

The undersigned hereby agrees to defend, indemnify, and save harmless the Vails Gate Fire District and the Vails Gate Fire Company, Inc. from and against any and all liability, loss, damages, claims for bodily injury and/or property damages, cost and expense, including counsel fees, to the extent permissible by law, that may occur or that may be alleged to have occurred in the course of the performance of this agreement by the contractor, whether such claims shall be made by an employee of the contractor or by a third party, the contractor covenants and agrees that he will pay all costs and expenses arising therefrom and in connection therewith, and if any judgment shall be rendered against the owner, architect/engineer and construction manager, in any such litigation, the contractor shall at his own expense satisfy and discharge the same.

By: \_\_\_\_\_  
(signature of authorized representative of corporation)

**DISCLOSURE OF TERMINATION**

Have the Bidder, its Owners or as Corporations under different name; at any time, been terminated from a Public Works Contract? If so, provide information as to the Contracting Agency, date of termination, and a description of circumstances surrounding the termination:

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**The Bidder understands and agrees that failure to fully and truthfully reply to this question shall be the basis for the disqualification of the Bidder from this, and any other bid submitted with respect to this project.**

## LIST OF SUBCONTRACTORS



### **List of Subcontractors**

The Bidder shall list the subcontractors, if any, to be used for this project. Provide the required information for each proposed subcontractor. Make appropriate copies of this form should the Bidder propose more than five (5) subcontractors. List at least five projects for each subcontractor that demonstrates the subcontractor's qualifications to perform the work of the project. The projects shall be similar size and complexity and have been completed within the last five (5) years by the subcontractor.

**(NOTE THIS FORM MUST BE COMPLETED BY BIDDER)**

**Subcontractor Name:** \_\_\_\_\_

**Type of Work:** \_\_\_\_\_

| <b><u>Owner</u></b> | <b><u>Contact Name</u></b> | <b><u>Phone Number</u></b> | <b><u>Location</u></b> | <b><u>Contract Amount</u></b> |
|---------------------|----------------------------|----------------------------|------------------------|-------------------------------|
|---------------------|----------------------------|----------------------------|------------------------|-------------------------------|

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |



LIST OF SUBCONTRACTORS

Subcontractor Name:

Type of Work:

| Owner | Contact Name | Phone Number | Location | Contract Amount |
|-------|--------------|--------------|----------|-----------------|
|       |              |              |          |                 |
|       |              |              |          |                 |
|       |              |              |          |                 |
|       |              |              |          |                 |
|       |              |              |          |                 |

Subcontractor Name:

Type of Work:

| Owner | Contact Name | Phone Number | Location | Contract Amount |
|-------|--------------|--------------|----------|-----------------|
|       |              |              |          |                 |
|       |              |              |          |                 |
|       |              |              |          |                 |
|       |              |              |          |                 |
|       |              |              |          |                 |

LIST OF SUBCONTRACTORS

Subcontractor Name: \_\_\_\_\_

Type of Work: \_\_\_\_\_

| <u>Owner</u> | <u>Contact Name</u> | <u>Phone Number</u> | <u>Location</u> | <u>Contract Amount</u> |
|--------------|---------------------|---------------------|-----------------|------------------------|
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |

Subcontractor Name: \_\_\_\_\_

Type of Work: \_\_\_\_\_

| <u>Owner</u> | <u>Contact Name</u> | <u>Phone Number</u> | <u>Location</u> | <u>Contract Amount</u> |
|--------------|---------------------|---------------------|-----------------|------------------------|
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |
|              |                     |                     |                 |                        |

# DRAFT AIA® Document A101™ – 2017

## Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »  
(In words, indicate day, month and year.)

BETWEEN the Owner:  
(Name, legal status, address and other information)

Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

and the Contractor:  
(Name, legal status, address and other information)

« »  
« »  
« »  
« »

for the following Project:  
(Name, location and detailed description)

New Storage Building (Phase I)  
New Fire Station (Phase II)  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

The Architect:  
(Name, legal status, address and other information)

H2M architects + engineers  
538 Broad Hollow Road  
Fourth Floor East  
Melville, New York, 11747

The Owner and Contractor agree as follows.

**ADDITIONS AND DELETIONS:**  
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™-2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™-2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

**ELECTRONIC COPYING** of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

## TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

## EXHIBIT A INSURANCE AND BONDS

### ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

### ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

*(Check one of the following boxes.)*

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☒ Established as follows:

*(Insert a date or a means to determine the date of commencement of the Work.)*

The date of commencement shall be set by issuance by Owner of a Notice to Proceed to Contractor.

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

#### § 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

*(Check one of the following boxes and complete the necessary information.)*

[ « » ] Not later than «One Ninety Two» ( «192» ) calendar days from the date of commencement of the Work.

[ « » ] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

| Portion of Work | Substantial Completion Date |
|-----------------|-----------------------------|
| N/A             | N/A                         |

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

#### ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » (\$ « » ), subject to additions and deductions as provided in the Contract Documents.

#### § 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

| Item                                                               | Price |
|--------------------------------------------------------------------|-------|
| As indicated on the Proposal Sheets (PB) within the Project Manual |       |
|                                                                    |       |

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. (Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

| Item | Price | Conditions for Acceptance |
|------|-------|---------------------------|
| N/A  | N/A   | N/A                       |

§ 4.3 Allowances, if any, included in the Contract Sum:  
(Identify each allowance.)

| Item                                                               | Price |
|--------------------------------------------------------------------|-------|
| As indicated on the Proposal Sheets (PB) within the Project Manual | \$    |

#### § 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

| Item                                                               | Units and Limitations | Price per Unit (\$0.00) |
|--------------------------------------------------------------------|-----------------------|-------------------------|
| As indicated on the Proposal Sheets (PB) within the Project Manual |                       |                         |

#### § 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

As indicated on the Proposal Sheets (PB) within the Project Manual

§ 4.6 Other:

*(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)*

§ 4.6.1 Contractor or a Subcontractor, or other person actually performing the work of any Change Order will be allowed up to a **ten percent (10%)** mark-up for overhead and profit. The overhead and profit mark-up shall be inclusive of all overhead costs including, but not limited to, charges for home office costs, management supervision, training, safety, vehicles and pickups, travel, reproduction, temporary facilities, computers, office equipment, small tools and expendables, cleaning up, and other incidentals. Small tools are defined as tools that do not have a new unit cost in excess of \$750.

§ 4.6.2 Tiered contractors supervising subcontracted work will be allowed up to a **five percent (5%)** mark-up on all changes under their supervision.

§ 4.6.3 Notwithstanding the above-mentioned mark-ups, tiered contractors supervising subcontracted work will be allowed no more than a **fifteen percent (15%)** mark-up in the aggregate for overhead and profit on all changes under their supervision.

## ARTICLE 5 PAYMENTS

### § 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

In keeping with requirements of the Owner's standard procedures.

~~§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » ( « » ) days after the Architect receives the Application for Payment.~~

~~*(Federal, state or local laws may require payment within a certain period of time.)*~~

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™-2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

#### § 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

*(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)*

Five percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:

*(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)*

N/A

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

*(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)*

As deemed appropriate by the Architect, upon satisfactory completion of the work.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

*(Insert any other conditions for release of retainage upon Substantial Completion.)*

N/A

~~§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.~~

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

#### § 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

N/A

#### § 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

*(Insert rate of interest agreed upon, if any.)*

N/A

## ARTICLE 6 DISPUTE RESOLUTION

### § 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

*(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)*

H2M Architects + Engineers

### § 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

*(Check the appropriate box.)*

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☒ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

Mediation

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction. Any litigation shall be commenced and venued in Orange County Supreme Court only.

## ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

*(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)*

The Owner shall pay for work completed or for items purchased or stored on site only. No additional fees shall apply.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

## ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

*(Name, address, email address, and other information)*

As determined by the Fire District

§ 8.3 The Contractor's representative:



(Name, address, email address, and other information)

<< >>  
<< >>  
<< >>  
<< >>  
<< >>  
<< >>

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

#### § 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

~~§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:~~

~~(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)~~

N/A

§ 8.7 Other provisions:

N/A

### ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- ~~.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:  
(Insert the date of the E203–2013 incorporated into this Agreement.)~~

- .5 Drawings

Number

As indicated in the Table of Contents

Title

Date

- .6 Specifications

Section

As indicated in the Table of Contents

Title

Date

Pages

- .7 Addenda, if any:

| Number | Date | Pages |
|--------|------|-------|
|        |      |       |

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

- .8 Other Exhibits:  
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ☐ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:  
(Insert the date of the E204-2017 incorporated into this Agreement.)

☐ ☐

[ ☐ ] The Sustainability Plan:

| Title | Date | Pages |
|-------|------|-------|
|       |      |       |

[ ☐ ] Supplementary and other Conditions of the Contract:

| Document | Title | Date | Pages |
|----------|-------|------|-------|
|          |       |      |       |

- .9 Other documents, if any, listed below:  
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

|           |                                                |
|-----------|------------------------------------------------|
| Exhibit A | Substantial Completion/Final Completion        |
| Exhibit B | Electronic Document and Data Exchange Protocol |

This Agreement entered into as of the day and year first written above.

\_\_\_\_\_  
OWNER (Signature)

☐ ☐ ☐

\_\_\_\_\_  
(Printed name and title)

\_\_\_\_\_  
CONTRACTOR (Signature)

☐ ☐ ☐

\_\_\_\_\_  
(Printed name and title)

**Exhibit A**  
Substantial Completion/Final Completion

A Project shall be considered substantially complete and finally complete according to the following definitions:

**PART A – SUBSTANTIAL COMPLETION**

**ARTICLE 1- General, as to each structure which is part of the Project:**

- 1.1 All temporary construction items not required for completion of the punch list, such as temporary walls, scaffolding, rigging, supports, strainers, blanks, etc., removed.
- 1.2 Floor broom cleaned and mopped and walls wiped clean.
- 1.3 Drains flushed and cleaned with covers/grates in place.
- 1.4 Site drainage system complete.
- 1.5 ~~Elevators~~, stairs, etc., complete and functional
- 1.6 All painting except for minor touch up complete.
- ~~1.7 All built in cabinetry, casework and hardware complete (shelves, cabinets, counters, etc.).~~
- 1.8 Verify Contractor-provided utilities for Owner-supplied equipment are installed and functional as per plans and specifications.
- 1.9 Use permit issued by local authority and/or Temporary Certificate of Occupancy (TCO) secured by Contractor from appropriate local authorities.
- 1.10 Wash Basins, showers, etc. complete and operational.
- 1.11 Building Management System operational.
- 1.12 All safety and fire protection systems tested and operational and proven to the Owner and Fire Marshall.
- 1.13 All communication, life safety and security systems tested and operational.
- 1.14 All doors installed and all air locks operational and tested.
- 1.15 All areas accessible and isolated from construction activities.
- 1.16 All signs in place.
- 1.17 Training of Owner personnel on the safe operation of all building utility systems complete. Owner to make personnel reasonably available as needed.
- 1.18 All safety-related punch list items complete.

**ARTICLE 2- Electrical**

- 2.1 All power, lighting, control equipment, circuitry, systems, etc., complete, cleaned, tested and functional. All Megger readings submitted and approved.
- 2.2 All protective devices set and functionally tested.
- 2.3 All lighting fixtures lamped per Contract Documents.

- 2.4 All receptacles functional, and properly marked with circuit(s) and panel number(s).
- 2.5 All emergency UPS and/or standby generator systems tested and operational including batteries fully charged. Battery chargers (power supplies) tested and functional.
- 2.6 At least one (1) set of (red-line) as-built drawings available for switching and troubleshooting.
- 2.7 List of fuses and overload heaters approved. Proper size fuses and overload heaters installed.
- 2.8 All spare parts (fuses, overload heaters, etc.) per Contract Documents available to Owner.
- 2.9 All temporary power circuitry, conduit, etc. removed.
- 2.10 All electrical equipment cleaned per the Contract Documents.
- 2.11 All unused openings closed.
- 2.12 Security System installed and operational.
- 2.13 All circuits, panels and electrical devices labeled.
- ~~2.14 Card access system installed and operational.~~
- ~~2.15 Data and phone cabling installed and operational.~~

### ARTICLE 3- Instrumentation

- 3.1 All field instruments installed, calibrated, documented and functionally tested.
- 3.2 All control valves and automated on/off valves installed, calibrated where required, documented and functionally tested.
- 3.3 All safety relief devices (valves/rupture discs) installed and functional. All blockages, plugs or blanks removed. Any documentation required by the specifications to be complete.
- 3.4 All tubing and signal/control wiring dressed and secured.
- 3.5 Control and I/O panels installed, tested, cleaned up and dressed out.
- 3.6 All control loops tested for functionality per loop sheets and P&ID's.
- 3.7 All manual back up panels installed; all wired/tubed, instruments calibrated, documented and components functionally tested.
- 3.8 All labeling completed.
- 3.9 All panels verified clean.

### ARTICLE 4- Mechanical

- 4.1 All utility systems mechanically complete, started up and functional per design parameters, including all ductwork, piping, insulation, controls and accessories.
- 4.2 All safety controls certified in operating condition.
- 4.3 All HVAC systems balanced to plus or minus ten percent (+10%) of design criteria.

- 4.4 Temporary construction and startup filters removed and final operating filters installed.
- 4.5 All HEPA filters tested and certified per specifications. All filters and framing systems inspected by filter manufacturer's representative. All inspection reports and certifications, as required by specifications, to be submitted to the Owner
- 4.6 All piping hydrostatically or pneumatically tested and witnessed by Owner. Any sections of pipe that fail the test shall be reworked and retested as required. All final tests to be witnessed by the Owner.
- 4.7 Flammable solvent based coatings applied and ventilated.
- 4.8 Piping systems painted and/or insulated and identified as required. All valves tagged and a valve ID form completed.
- 4.9 Instruments and controls calibrated, installed and connected to the system.
- 4.10 Piping systems flushed; all traps and strainers cleaned.
- 4.11 Piping systems chemically cleaned, passivated and/or sanitized (where required).
- 4.12 Electrical connections completed, tested and verified.
- 4.13 Electrical motors checked with respect to amperage and rotation. All information to be documented and submitted to the Owner.
- 4.14 Confirmation that all water systems are in compliance with project specifications.
- 4.15 Chemical and biological (where required) analysis of water, air, etc., in utility systems checked for concurrence with design criteria. Sampling, testing and protocol shall be subject to Owner's approval prior to such test."
- 4.16 Equipment checked for alignment, balancing and noise, and documentation, as required by specifications, submitted to the Owner.
- 4.17 Utility equipment started up by factory representative, commissioned and installation certified.
- 4.18 In-place checkout and verification witnessed by Owner of building system instrumentation and control systems.
- 4.19 Systems for controlling room air volumes or pressurization tested and calibrated and proven functional by manufacturer's representative or personnel.
- 4.20 All clean steam systems functionally tested and calibrated.
- 4.21 Fire protection system complete and operational and Factory Mutual approved, including fire water storage, pumps, extinguishers, hoses, etc.
- 4.22 Waste treatment systems installation complete and functionally tested.
- 4.23 All safety devices such as emergency showers, eye washers, etc. complete, tested and operational.
- 4.24 All equipment labeled per the Contract Documents.

#### **ARTICLE 5- Operational Manuals and Personnel Training**

- 5.1 Operational manuals and "as built" drawings made available to allow Owner safely and efficiently to operate all equipment and systems installed by the Contractor.

- 5.2 Owner's Operating Personnel trained by Contractor on all building equipment as outlined in the Contract Documents.
- 5.3 Contractor to provide maintenance and operational records and twenty four (24) hours per day field personnel as required to properly operate all Contractor-installed equipment for any systems and equipment required to be run prior to Substantial Completion, as required by Owner.

## **PART B – FINAL COMPLETION**

### **ARTICLE 6- PROJECT FINAL COMPLETION.**

Final Completion will be attained when the following has occurred:

- 6.1 The appropriate local governmental authority has issued a Final Certificate of Occupancy.
- 6.2 All punch list work has been completed and accepted by Owner.
- 6.3 Contractor has confirmed to Owner that it has provided Owner with all as-built "red lined" documentation. The Owner will have a reasonable time to review the as-built documents submitted by Contractor. Contractor shall remedy any deviations found in the review process.
- 6.4 All turn over packages for mechanical, electrical, elevator, fire protection, and utility systems, building automation and distributed control systems, utility equipment, as well as architectural and civil bid packages have been assembled, reviewed and accepted by the Owner.
- 6.5 All financial matters have been resolved and reconciled.
- 6.6 All Subcontractors have submitted final invoices and provided the documentation required under Article 4 of the Agreement, including a Final Lien Waiver and Release of Claims.
- 6.7 All warranty documentation has been provided to, reviewed by and accepted by the Owner.
- 6.8 The Design Professional has issued the certificate of Final Completion.

**EXHIBIT B**  
**Electronic Document and Data Exchange Protocol**

- .1 The transmission of Digital Data constitutes a warranty by the transmitting party to the receiving party that the transmitting party (i) is the copyright owner of the Digital Data, or (ii) has permission from the copyright owner to transmit the Digital Data for its use on the Project, and (iii) is authorized to transmit any Confidential Information contained within the Digital Data.
- .2 The transmitting party does not convey any right in the Digital Data or in the software used to generate the data. The receiving party may use Digital Data conveyed to it only in accordance with the permissions provided to the receiving party (i) in this Agreement, (ii) in other documents incorporated by reference into this Agreement, including the general conditions of the contract for construction, or (iii) in a separate agreement governing the rights of use to Digital Data such as a license agreement or a BIM protocol agreement.
- .3 The receiving party's use, modification, or further transmission of Digital Data is governed by the provisions of Sections 1.5 through 1.7 of the AIA A201-2007. The parties agree to establish protocols regarding the acceptable data formats to be used for various documents which will be exchanged in connection with the Project.
- .4 To the fullest extent permitted by law, the receiving party shall indemnify and defend the transmitting party from and against all claims arising from or related to the receiving party's modification to, or unlicensed use of, Digital Data.
- .5 For purposes of this Agreement, the term "Digital Data" means information, communications, drawings, or designs created or stored for the Project in digital form.

# DRAFT AIA® Document A201™ – 2017

## General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

New Storage Building (Phase I)  
New Fire Station (Phase II)  
Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

THE OWNER:

(Name, legal status and address)

Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

THE ARCHITECT:

(Name, legal status and address)

H2M architects + engineers  
538 Broad Hollow Road  
Fourth Floor East  
Melville, New York 11747

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#### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 Basic Definitions

#### § 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

#### § 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

#### § 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

#### § 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

#### § 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

#### § 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

#### § 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

#### § 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

### § 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

### § 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

### § 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

### § 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

### § 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

### § 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

### § 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or

relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

## ARTICLE 2 OWNER

### § 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

### § 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

### § 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

#### § 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

#### § 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

### ARTICLE 3 CONTRACTOR

#### § 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

#### § 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as

the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

### § 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

### § 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.



### § 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

### § 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

### § 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

### § 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

### § 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

### § 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

### § 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

### § 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and

similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

### § 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will



specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

### § 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

### § 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

### § 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

### § 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

### § 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

### § 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

## ARTICLE 4 ARCHITECT

### § 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

### § 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

### § 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in

number and means a Subcontractor or an authorized representative of the Subcontractor. The term “Subcontractor” does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term “Sub-subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

## § 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

## § 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor’s Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

## § 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

## ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

### § 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

### § 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.



§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

### § 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

### § 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

### § 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

~~§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.~~

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

#### § 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

### ARTICLE 8 TIME

#### § 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

## § 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

## § 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

## ARTICLE 9 PAYMENTS AND COMPLETION

### § 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

### § 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

### § 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

~~§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.~~

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.



§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

#### § 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

#### § 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
  - .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
  - .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
  - .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
  - .5 damage to the Owner or a Separate Contractor;
  - .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

## § 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

## § 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

## § 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

## § 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

## § 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

### § 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;

- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

#### § 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

#### § 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed



by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

#### § 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

### ARTICLE 11 INSURANCE AND BONDS

#### § 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

## § 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

## § 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

## § 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

#### §11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

### ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

#### § 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

#### § 12.2 Correction of Work

##### § 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

##### § 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.



§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

### § 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## ARTICLE 13 MISCELLANEOUS PROVISIONS

### § 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

### § 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

### § 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

### § 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

#### § 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

### ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

#### § 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract

Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

## § 14.2 Termination by the Owner for Cause

### § 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

## § 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

## § 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work

properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

## ARTICLE 15 CLAIMS AND DISPUTES

### § 15.1 Claims

#### § 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term “Claim” also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

#### § 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

#### § 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

#### § 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker’s decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

#### § 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

#### § 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor’s Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

#### § 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

## § 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.



§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

### § 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

### § 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

### § 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party

provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

# APPLICATION AND CERTIFICATE FOR PAYMENT

AIA DOCUMENT G702 (Instructions on reverse side) PAGE ONE OF PAGES

TO OWNER:  
  
FROM CONTRACTOR:  
  
CONTRACT FOR:

PROJECT:  
  
VIA ARCHITECT:

APPLICATION NO.:  
PERIOD TO:  
PROJECT NOS.:  
  
CONTRACT DATE:

Distribution to:  
☐ OWNER  
☐ ARCHITECT  
☐ CONTRACTOR  
☐  
☐

## CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM .....\$

2. Net change by Change Orders .....\$

3. CONTRACT SUM TO DATE (Line 1 + 2) .....\$

4. TOTAL COMPLETED & STORED TO DATE .....\$  
(Column G on G703)

5. RETAINAGE:  
a. \_\_\_\_\_% of Completed Work .....\$  
(Columns D + E on G703)  
b. \_\_\_\_\_% of Stored Material .....\$  
(Column F on G703)  
Total Retainage (Line 5a + 5b or  
Total in Column I of G703) .....\$

6. TOTAL EARNED LESS RETAINAGE .....\$  
(Line 4 less Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT  
(Line 6 from prior Certificate) .....\$

8. CURRENT PAYMENT DUE .....\$

9. BALANCE TO FINISH, INCLUDING RETAINAGE  
(Line 3 less Line 6) .....\$

| CHANGE ORDER SUMMARY                               | ADDITIONS | DEDUCTIONS |
|----------------------------------------------------|-----------|------------|
| Total changes approved in previous months by Owner |           |            |
| Total approved this Month                          |           |            |
| TOTALS                                             |           |            |
| NET CHANGES by Change Order                        |           |            |

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: \_\_\_\_\_ Date: \_\_\_\_\_

State of: \_\_\_\_\_

County of: \_\_\_\_\_

Subscribed and sworn to before  
me this \_\_\_\_\_ day of \_\_\_\_\_

Notary Public:

My Commission expires: \_\_\_\_\_

## ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED .....\$  
(Attach explanation if amount certified differs from the amount applied for. Initial all figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.)

ARCHITECT:

By: \_\_\_\_\_ Date: \_\_\_\_\_

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.



# INSTRUCTION SHEET

FOR AIA DOCUMENT G702

## A. GENERAL INFORMATION

### 1. Purpose and Related Documents

AIA Document G702, Application and Certificate for Payment, is to be used in conjunction with AIA Document G703, Continuation Sheet. These documents are designed to be used on a Project where a Contractor has a direct Agreement with the Owner. Procedures for their use are covered in AIA Document A201, General Conditions of the Contract for Construction, 1987 Edition.

### 2. Use of Current Documents

Prior to using any AIA document, the user should consult the AIA, an AIA component chapter or a current AIA Documents List to determine the current edition of each document.

### 3. Limited License for Reproduction

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## B. COMPLETING THE G702 FORM:

After the Contractor has completed AIA Document G703, Continuation Sheet, summary information should be transferred to AIA Document G702, Application and Certificate for Payment.

The Contractor should sign G702, have it notarized, and submit it, together with G703, to the Architect.

The Architect should review G702 and G703 and, if they are acceptable, complete the Architect's Certificate for Payment on G702. The Architect may certify a different amount than that applied for, pursuant to Paragraphs 9.5 and 9.6 of A201. The Architect should then initial all figures on G702 and G703 that have been changed to conform to the amount certified and attach an explanation. The completed G702 and G703 should be forwarded to the Owner.

*The following is an example of an Application for Payment for work in progress. Please note that dollar amounts shown below are for illustrative purposes only, and are not intended to reflect actual construction costs.*

### CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

|                                                                           |               |
|---------------------------------------------------------------------------|---------------|
| 1. ORIGINAL CONTRACT SUM                                                  | \$ 100,000.00 |
| 2. Net change by Change Orders                                            | \$ 5,000.00   |
| 3. CONTRACT SUM TO DATE (Line 1 + 2)                                      | \$ 105,000.00 |
| 4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)                    | \$ 40,000.00  |
| 5. RETAINAGE:                                                             |               |
| a. % of Completed Work (Columns D + E on G703)                            | \$ 3,000.00   |
| b. % of Stored Material (Column F on G703)                                | \$ 500.00     |
| Total Retainage (Line 5a + 5b or Total in Column I of G703)               | \$ 3,500.00   |
| 6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total)                 | \$ 36,500.00  |
| 7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate) | \$ 18,000.00  |
| 8. CURRENT PAYMENT DUE                                                    | \$ 18,500.00  |
| 9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)            | \$ 68,500.00  |

| CHANGE ORDER SUMMARY                               | ADDITIONS | DEDUCTIONS |
|----------------------------------------------------|-----------|------------|
| Total changes approved in previous months by Owner |           |            |
| Total approved this Month                          | 10,000.00 | 5,000.00   |
| TOTALS                                             | 10,000.00 | 5,000.00   |
| NET CHANGES by Change Order                        | 5,000.00  |            |

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR: Robert Apple  
By: ROBERT APPLE, PRESIDENT Date: AUGUST 1, 1992

State of: VIRGINIA  
County of: FAIRFAX  
Subscribed and sworn to before me this FIRST day of AUGUST 1992  
Notary Public: John Smith  
My Commission expires: DEC. 31, 1993

### ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$ \_\_\_\_\_  
(Attach explanation if amount certified differs from the amount applied for. Initial all figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.)

ARCHITECT:  
By: \_\_\_\_\_ Date: \_\_\_\_\_  
This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

## C. MAKING PAYMENT

The Owner should make payment directly to the Contractor based on the amount certified by the Architect on AIA Document G702, Application and Certificate for Payment. The completed form contains the name and address of the Contractor. Payment should not be made to any other party unless specifically indicated on G702.

## D. EXECUTION OF THE DOCUMENT

Each person executing the Agreement should indicate the capacity in which they are acting (i.e., president, secretary, partner, etc.) and the authority under which they are executing the Agreement. Where appropriate, a copy of the resolution authorizing the individual to act on behalf of the firm or entity should be attached.

## Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.  
In tabulations below, amounts are stated to the nearest dollar.  
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:  
APPLICATION DATE:  
PERIOD TO:

ARCHITECT'S PROJECT NO:

| A<br>ITEM<br>NO. | B<br>DESCRIPTION OF WORK | C<br>SCHEDULED<br>VALUE | D<br>WORK COMPLETED                     |  | E<br>THIS PERIOD | F<br>MATERIALS<br>PRESENTLY<br>STORED<br>(NOT IN<br>D OR E) | G<br>TOTAL<br>COMPLETED<br>AND STORED<br>TO DATE<br>(D+E+F) | H<br>BALANCE<br>TO<br>FINISH<br>(C - G) | I<br>RETAINAGE<br>(IF VARIABLE<br>RATE) |
|------------------|--------------------------|-------------------------|-----------------------------------------|--|------------------|-------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------|-----------------------------------------|
|                  |                          |                         | FROM PREVIOUS<br>APPLICATION<br>(D + E) |  |                  |                                                             |                                                             |                                         |                                         |
|                  |                          |                         |                                         |  |                  |                                                             |                                                             |                                         |                                         |
|                  |                          |                         |                                         |  |                  |                                                             |                                                             |                                         |                                         |

**CAUTION:** You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

# **AIA® Document G703™ – 1992**

## Continuation Sheet

### GENERAL INFORMATION

**Purpose and Related Documents.** AIA Document G702, Application and Certificate for Payment, is to be used in conjunction with AIA Document G703, Continuation Sheet. These documents are designed for use on Projects where the Contractor has a direct Agreement with the Owner. Procedures for their use are covered in AIA Document A201, General Conditions of the Contract for Construction.

**Use of Current Documents.** Prior to using any AIA Contract Document, users should consult [www.aia.org](http://www.aia.org) or a local AIA component to verify the most recent edition.

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### COMPLETING THE G703 FORM

**Heading:** This information should be completed in a manner consistent with similar information on AIA Document G702, Application and Certificate for Payment.

**Columns A, B & C:** These columns should be completed by identifying the various portions of the Project and their scheduled values consistent with the schedule of values submitted to the Architect at the commencement of the Project or as subsequently adjusted. The breakdown may be by sections of the Work or by Subcontractors and should remain consistent throughout the Project. Multiple pages should be used when required.

Column C should be subtotaled at the bottom when more than one page is used and totaled on the last page. Initially, this total should equal the original Contract Sum. The total of column C may be adjusted by Change Orders during the Project.

**Column D:** Enter in this column the amount of completed Work covered by the previous application (columns D & E from the previous application). Values from column F (Materials Presently Stored) from the previous application should not be entered in this column.

**Column E:** Enter here the value of Work completed at the time of this application, including the value of materials incorporated in the project that were listed on the previous application under Materials Presently Stored (column F).

**Column F:** Enter here the value of Materials Presently Stored for which payment is sought. The total of the column must be recalculated at the end of each pay period. This value covers both materials newly stored for which payment is sought and materials previously stored which are not yet incorporated into the Project. Mere payment by the Owner for stored materials does not result in a deduction from this column. Only as materials are incorporated into the Project is their value deducted from this column and incorporated into column E (Work Completed—This Period.)

**Column G:** Enter here the total of columns D, E and F. Calculate the percentage completed by dividing column G by column C.

**Column H:** Enter here the difference between column C (Scheduled Value) and column G (Total Completed and Stored to Date).

**Column I:** This column is normally used only for contracts where variable retainage is permitted on a line-item basis. It need not be completed on projects where a constant retainage is withheld from the overall contract amount.

**Change Orders:** Although Change Orders could be incorporated by changing the schedule of values each time a Change Order is added to the Project, this is not normally done. Usually, Change Orders are listed separately, either on their own G703 form or at the end of the basic schedule. The amount of the original contract adjusted by Change Orders is to be entered in the appropriate location on the G702 form.

**Construction Change Directives:** Amounts not in dispute that have been included in Construction Change Directives should be incorporated into one or more Change Orders. Amounts remaining in dispute should be dealt with according to Section 7.3 in A201.

*The following is an example of a Continuation Sheet for work in progress. Please note that dollar amounts shown below are for illustrative purposes only, and are not intended to reflect actual construction costs.*

| A<br>ITEM NO. | B<br>DESCRIPTION OF WORK | C<br>SCHEDULED VALUE | D<br>WORK COMPLETED               |             | F<br>MATERIALS PRESENTLY STORED (NOT IN D OR E) | G                                          |           | H<br>BALANCE TO FINISH (C - G) | I<br>RETAINAGE (IF VARIABLE RATE) |
|---------------|--------------------------|----------------------|-----------------------------------|-------------|-------------------------------------------------|--------------------------------------------|-----------|--------------------------------|-----------------------------------|
|               |                          |                      | FROM PREVIOUS APPLICATION (D + E) | THIS PERIOD |                                                 | TOTAL COMPLETED AND STORED TO DATE (D+E+F) | % (G ÷ C) |                                |                                   |
| 1             | MOBILIZATION             | 5,000                | 5,000                             | 0           | 0                                               | 5,000                                      | 100       | 0                              |                                   |
| 2             | STUMP REMOVAL            | 5,000                | 5,000                             | 0           | 0                                               | 5,000                                      | 100       | 0                              |                                   |
| 3             | EARTH WORK               | 15,000               | 10,000                            | 5,000       | 0                                               | 15,000                                     | 100       | 0                              |                                   |
| 4             | LOWER RETAINING WALL     | 10,000               | 0                                 | 5,000       | 0                                               | 5,000                                      | 50        | 5,000                          |                                   |
| 5             | CURBS & MISC. CONC.      | 5,000                | 0                                 | 0           | 0                                               | 0                                          | 0         | 5,000                          |                                   |
| 6             | PAVING, UPPER DRIVE      | 20,000               | 0                                 | 0           | 0                                               | 0                                          | 0         | 20,000                         |                                   |
| 7             | PAVING, LOWER DRIVE      | 20,000               | 0                                 | 0           | 0                                               | 0                                          | 0         | 20,000                         |                                   |
| 8             | PAVERS                   | 20,000               | 0                                 | 0           | 10,000                                          | 10,000                                     | 50        | 10,000                         |                                   |
| 9             | BRICK WORK               | 5,000                | 0                                 | 0           | 0                                               | 0                                          | 0         | 5,000                          |                                   |
| 10            |                          |                      |                                   |             |                                                 |                                            |           |                                |                                   |
| 11            |                          | 105,000              | 20,000                            | 10,000      | 10,000                                          | 40,000                                     |           | 65,000                         |                                   |

# CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

AIA Document G706

(Instructions on reverse side)

|            |                          |
|------------|--------------------------|
| OWNER      | <input type="checkbox"/> |
| ARCHITECT  | <input type="checkbox"/> |
| CONTRACTOR | <input type="checkbox"/> |
| SURETY     | <input type="checkbox"/> |
| OTHER      | <input type="checkbox"/> |

TO OWNER:  
(Name and address)

ARCHITECT'S PROJECT NO.:

CONTRACT FOR:

PROJECT:  
(Name and address)

CONTRACT DATED:

STATE OF:  
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose.

Indicate attachment: ☐ yes ☐ no

*The following supporting documents should be attached hereto if required by the Owner:*

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR:  
(Name and address)

BY: \_\_\_\_\_  
(Signature of authorized representative)

\_\_\_\_\_  
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:



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G706—1994

# INSTRUCTION SHEET

## FOR AIA DOCUMENT G706, CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

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### A. GENERAL INFORMATION

#### 1. Purpose

This document is intended for use when the Contractor is required to provide a sworn statement verifying that debts and claims have been settled, except for those listed by the Contractor under "EXCEPTIONS" in the document. G706 is typically executed as a condition of final payment.

#### 2. Related Documents

This document may be used with most of the AIA's Owner-Contractor agreements and general conditions, such as A201 and its related family of documents. G706 also requires the attachment of several supporting documents, including G706A, Contractor's Affidavit of Release of Liens, and G707, Consent of Surety to Reduction in or Release of Retainage.

#### 3. Use of Current Documents

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### B. CHANGES FROM THE PREVIOUS EDITION

A cross-reference to AIA Document A201 has been deleted to permit the use of G706 with other families of AIA documents, including construction management, interiors and design-build.

### C. COMPLETING THE G706 FORM

**GENERAL:** The Owner-Contractor Agreement is the usual source of required information such as the contract date and the names and addresses of the Owner, Project and Contractor.

**ARCHITECT'S PROJECT NO.:** This information is typically supplied by the Architect and entered on the form by the Contractor.

**CONTRACT FOR:** This refers to the scope of the contract, such as "General Construction" or "Mechanical Work".

**AFFIDAVIT:** Indicate the state and county where the Affidavit is made. This is not necessarily the same location as the Project, but should be the location where the notary is authorized to administer sworn oaths. If there are any EXCEPTIONS to the statement, these should be listed in the space provided; otherwise enter as "None". It may be a stipulation of the Contract Documents that the Owner has the right to require the Contractor to furnish a bond to cover each exception listed on the Affidavit.

**SUPPORTING DOCUMENTS:** The AIA documents listed as attachments to the G706 form should be of the same (current) edition date as G706. The AIA does not publish a "Release or Waiver of Liens" for contractors or subcontractors because of the great diversity of releases or waivers permitted by various state mechanics lien laws. Forms for such purposes may be available from local contractors' associations or may be written with the assistance of legal counsel.

### D. EXECUTION OF THE DOCUMENT

The Notary Public should administer a sworn oath to the Contractor referencing the written statements appearing on G706, and should duly sign and seal this document containing the Contractor's signature. G706 should be signed by the Contractor or the Contractor's authorized representative.

# CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

AIA Document G706A

(Instructions on reverse side)

|            |                          |
|------------|--------------------------|
| OWNER      | <input type="checkbox"/> |
| ARCHITECT  | <input type="checkbox"/> |
| CONTRACTOR | <input type="checkbox"/> |
| SURETY     | <input type="checkbox"/> |
| OTHER      | <input type="checkbox"/> |

TO OWNER:  
*(Name and address)*

ARCHITECT'S PROJECT NO.:

CONTRACT FOR:

PROJECT:  
*(Name and address)*

CONTRACT DATED:

STATE OF:  
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR:  
*(Name and address)*

BY: \_\_\_\_\_  
*(Signature of authorized representative)*

\_\_\_\_\_  
*(Printed name and title)*

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:



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G706A—1994

# INSTRUCTION SHEET

## FOR AIA DOCUMENT G706A, CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

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### A. GENERAL INFORMATION

#### 1. Purpose

This document is intended for use as a companion to AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims.

#### 2. Related Documents

This document may be used with most of the AIA's Owner-Contractor agreements and general conditions, such as A201 and its related family of documents. As noted above, G706A is a companion document to AIA Document G706.

#### 3. Use of Current Documents

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### B. CHANGES FROM THE PREVIOUS EDITION

A cross-reference to AIA Document A201 has been deleted to permit the use of G706A with other families of AIA documents, including construction management, interiors and design/build.

### C. COMPLETING THE G706A FORM

**GENERAL:** The Owner-Contractor Agreement is the usual source of required information such as the contract date and the names and addresses of the Owner, Project and Contractor.

**ARCHITECT'S PROJECT NO.:** This information is typically supplied by the Architect and entered on the form by the Contractor.

**CONTRACT FOR:** This refers to the scope of the contract, such as "General Construction" or "Mechanical Work".

**AFFIDAVIT:** Indicate the state and county where the Affidavit is made. This is not necessarily the same location as the Project, but should be the location where the notary is authorized to administer sworn oaths. If there are any EXCEPTIONS to the statement, these should be listed in the space provided; otherwise enter as "None". It may be a stipulation of the Contract Documents that the Owner has the right to require the Contractor to furnish a bond to cover each exception listed on the Affidavit.

**SUPPORTING DOCUMENTS:** The AIA does not publish a "Release or Waiver of Liens" for contractors or subcontractors because of the great diversity of releases or waivers permitted by various state mechanics lien laws. Forms for such purposes may be available from local contractors' associations or may be written with the assistance of legal counsel.

### D. EXECUTION OF THE DOCUMENT

The Notary Public should administer a sworn oath to the Contractor referencing the written statements appearing on G706A, and should duly sign and seal this document containing the Contractor's signature. G706A should be signed by the Contractor or the Contractor's authorized representative.

# CONSENT OF SURETY TO FINAL PAYMENT

AIA Document G707

(Instructions on reverse side)

|            |                          |
|------------|--------------------------|
| OWNER      | <input type="checkbox"/> |
| ARCHITECT  | <input type="checkbox"/> |
| CONTRACTOR | <input type="checkbox"/> |
| SURETY     | <input type="checkbox"/> |
| OTHER      | <input type="checkbox"/> |

TO OWNER:  
(Name and address)

ARCHITECT'S PROJECT NO.:

CONTRACT FOR:

PROJECT:  
(Name and address)

CONTRACT DATED:

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the  
(Insert name and address of Surety)

on bond of  
(Insert name and address of Contractor)

, SURETY,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of  
any of its obligations to  
(Insert name and address of Owner)

, CONTRACTOR,

as set forth in said Surety's bond.  
  
IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:  
(Insert in writing the month followed by the numeric date and year.)

, OWNER,

(Surety)

(Signature of authorized representative)

(Printed name and title)

Attest:  
(Seal):



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G707—1994



# INSTRUCTION SHEET

## FOR AIA DOCUMENT G707, CONSENT OF SURETY TO FINAL PAYMENT

---

### A. GENERAL INFORMATION

#### 1. Purpose

This document is intended for use as a companion to AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims, on construction projects where the Contractor is required to furnish a bond. By obtaining the Surety's approval of final payment to the Contractor and its agreement that final payment will not relieve the Surety of any of its obligations, the Owner may preserve its rights under the bond.

#### 2. Related Documents

This document may be used with most of the AIA's Owner-Contractor agreements and general conditions, such as A201 and its related family of documents. As noted above, this is a companion document to AIA Document G706.

#### 3. Use of Current Documents

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### B. CHANGES FROM THE PREVIOUS EDITION

Changes in the location of various items of information were made, without revision to the substance of the document.

### C. COMPLETING THE G707 FORM

GENERAL: The bond form is the usual source of required information such as the contract date and the names and addresses of the Surety, Owner, Contractor and Project.

ARCHITECT'S PROJECT NO.: This information is typically supplied by the Architect and entered on the form by the Contractor.

CONTRACT FOR: This refers to the scope of the contract, such as "General Construction" or "Mechanical Work".

### D. EXECUTION OF THE DOCUMENT

The G707 form requires both the Surety's seal and the signature of the Surety's authorized representative.

**Bid Bond**

**CONTRACTOR:**

(Name, legal status and address)

« To Be Determined »

**SURETY:**

(Name, legal status and principal place of business)

« To Be Determined »

**OWNER:**

(Name, legal status and address)

Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

**BOND AMOUNT:** \$ « 5% of Bid »

**PROJECT:**

(Name, location or address, and Project number, if any)

New Storage Building (Phase I)  
New Fire Station (Phase II)  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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Signed and sealed this « » day of « » , 2022

(Witness)

(Witness)

(Contractor as Principal)

(Seal)

(Title)

(Surety)

(Seal)

(Title)

# DRAFT AIA<sup>®</sup> Document A312<sup>™</sup> - 2010

## Performance Bond

### CONTRACTOR:

(Name, legal status and address)

« To be determined »

### SURETY:

(Name, legal status and principal place of business)

« To be determined »

### OWNER:

(Name, legal status and address)

Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

### CONSTRUCTION CONTRACT

Date: « TBD »

Amount: \$ « TBD »

Description:

(Name and location)

New Storage Building (Phase I)  
New Fire Station (Phase II)  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

### BOND

Date:

(Not earlier than Construction Contract Date)

« TBD »

Amount: \$ « TBD »

Modifications to this Bond: ☐ « » None ☐ « » See Section 16

### CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

### SURETY

Company: (Corporate Seal)

Signature:

Name and

Title:

(Any additional signatures appear on the last page of this Performance Bond.)

Signature:

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### § 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 16 Modifications to this bond are as follows:

Address:

# DRAFT AIA<sup>®</sup> Document A312™ - 2010

## Payment Bond

### CONTRACTOR:

(Name, legal status and address)

« To be determined »

### SURETY:

(Name, legal status and principal place of business)

« To be determined »

### OWNER:

(Name, legal status and address)

Vails Gate Fire District  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

### CONSTRUCTION CONTRACT

Date: « TBD »

Amount: \$ « TBD »

Description:

(Name and location)

New Storage Building (Phase I)  
New Fire Station (Phase II)  
872 Blooming Grove Turnpike  
New Windsor, NY 12553

### BOND

Date:

(Not earlier than Construction Contract Date)

« TBD »

Amount: \$ « TBD »

Modifications to this Bond: ☐ « » None ☐ « » See Section 18

### CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

### SURETY

Company: (Corporate Seal)

Signature:

Name and

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature:

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

## § 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

Company:

*(Corporate Seal)*

**SURETY**

Company:

*(Corporate Seal)*

Signature:

Name and Title:

Address:

Signature:

Name and Title:

Address:

## PART 1 - GENERAL

## 1.01 BRIEF PURPOSE OF PROJECT / GENERAL

- A. The purpose of the project is to construct a prefabricated storage building (Phase I) and a new firehouse (Phase II). Work includes, but is not limited to, all of the mechanical, electrical, plumbing, foundation, utility, & site work as indicated in the construction documents.
- B. This Section provides an abbreviated summary of the work for the Construction Contract associated with the Owner's program to construct the project.
- C. In the event that any of the provisions in the technical specifications conflicts with the general conditions, the provision more favorable to the owner, as determined by the owner in its sole discretion, shall govern.

## 1.02 NOMENCLATURE

- A. Where the terms "Engineer/Architect", "Architect/Engineer", "Engineer", or "Architect" are used throughout these Contract Documents, they shall mean the firm of H2M architects + engineers as may be abbreviated by H2M or H2M Group.
- B. The terms "Contractor" and/or "Prime Contractor" where used shall refer to the individual or company who has entered into an agreement with the Owner to perform the work contained within these Contract Documents. The lack of word capitalization shall be incidental.
- C. Where the terms "owner" or "owner's construction representative" are used, they will be defined as a person selected by the owner, or the actual owner.

## 1.03 ABBREVIATED SUMMARY OF CONTRACT WORK

- A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each contractor shall coordinate, through the Owner/Architect/Engineer, the work of their contract with the work by others.
- B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.
- C. The work includes, but is not limited to, the following:
  - 1. to construct a temporary response / storage building (Phase I) and a new firehouse (Phase II).
  - 2. Site clearing, grubbing, sheeting, bracing, excavation, soil erosion protection, slope protection, earth movement, subgrade preparation, removal of excess and/or unsuitable excavated material, dewatering, and import of suitable material, as necessary to install and construct all the work defined within the Contract Documents.
  - 3. Demolition and removals as shown,
  - 4. Construction of prefabricated storage building
  - 5. Potable water service to the facility to the extent shown
  - 6. Miscellaneous metals including railing, grating, and supports
  - 7. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
  - 8. Preliminary site work including: utility mark-out, erection of safety fencing, erosion control facilities, clearing and grubbing.
  - 9. New site drainage structures and piping.

10. Excavation, removal of excess and/or unsuitable excavated material, sheeting reinforcement, import of suitable material, soil compaction and testing.
11. Construction of new building, including: all concrete footings/foundations/walls, concrete reinforcement, penetrations, structural steel, masonry, light-gauge, drywall, framing, roofing, windows, doors, louvers, stairs, siding, finishes, etc.
12. Install epoxy floor coating system.
13. Site restoration including final grading and placement of topsoil and seeding.
14. Asphalt removal new paving of driveway areas.
15. New asphalt paving.
16. New sidewalks and concrete curbing.
17. New generator including the construction of its concrete slab
18. New fuel island and storage tank
19. New RPZ and water service to building. New toilet fixtures and gang sink.
20. New lighting fixtures, wiring and associated equipment.
21. Main secondary feeders, power distribution, and instrumentation control wiring. Provide, mount, and install electrical conduit, wire, fittings, boxes, panels, and electrical accessories.
22. New fire alarm and fire sprinkler systems
23. All associated electrical, plumbing and mechanical work
24. Project closeout submittals.

D. All other work shown and specified within the Contract Documents for Contract G.

#### 1.04 PARTIAL LISTING OF SPECIFIC CONTRACT REQUIREMENTS

- A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but are not limited to, the following:
1. A Project Labor Agreement is in effect for this project as included in the Supplementary Conditions.

#### 1.05 PARTIAL LISTING OF OVERALL CONTRACT REQUIREMENTS

- A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
1. Debris removal and daily and final cleaning up.
  2. Coordination with utility companies necessary to schedule connection of services, and management of the installation.
  3. Site utilization and management so as not to disrupt the Owner's ability to operate the existing facilities in a safe and efficient manner.
  4. Product and equipment storage and handling requirements.
  5. Site safety in accordance with all applicable federal, state, and local regulations.
  6. Project submittals, meetings, testing services, work plans, schedules, shop drawings, closeout procedures and documents, manuals, as-built drawings, and final commissioning of the work shall be provided as required by the Contract.

#### 1.06 OWNER SUPPLIED PRODUCTS AND UTILITIES

- A. The Owner will not be supplying equipment, labor, or tools for the project.

#### 1.07 EXISTING CONDITIONS

- A. The Drawings show certain information that has been obtained by the Owner regarding various conditions that exist at the location of the project both below and at grade.

- B. The Owner and the Architect/Engineer expressly disclaims all responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing facilities.
- C. In the case where the Contractor discovers an obstruction not indicated on the Drawings or not described via specification reference, then the Contractor shall immediately notify the Architect/Engineer of the obstructions' existence.
- D. The Architect/Engineer will determine if the obstruction is to be relocated or removed.
- E. Compensation for this extra work will be paid for in accordance with the provisions in the Contract for "Extra Work".

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**END OF SECTION 011100**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Site access and control of areas outside of site.
- B. Contractor use of the premises.
- C. Contractor storage, parking and deliveries.
- D. Work hours, employee conduct and miscellaneous employee requirements.

## 1.02 SITE ACCESS AND CONTROL

- A. The Contractor shall use the designated entrance to the site as shown on the drawings. If no site entrance is designated, the Contractor shall use an entrance designated by the Owner's Construction Representative.
  - 1. The Owner may permit, solely at the Owner's discretion, the temporary use of another entrance for site access.
  - 2. The Owner will only review requests made by the Contractor for an exception to the designated site entrance if made in writing at least 72 hours in advance of each of the times desired for use.
- B. The Contractor is to maintain the entrance area clear of materials, vehicles and any other obstacle or debris. Failure to do so will result in a minimum back charge of \$750 per occurrence.
- C. The area around the site is a residential neighborhood. The Owner intends to be a good neighbor. The Contractor shall not close any road for any period in time. The Contractor shall take whatever measures are necessary to not cause any inconvenience to the area's residents.
- D. The Contractor is responsible to employ methods to prevent construction materials and/or debris from leaving the site. The Contractor is responsible to routinely monitor the areas surrounding the site during the day as well as at the end of the work-day and to immediately clean up any area to its previous condition.
- E. The Contractor shall employ methods to prevent the transmission of dirt from vehicles driving on exposed areas of the site from reaching the surrounding roadways. The Contractor will be responsible to immediately clean the roadway, should the measures being taken by the Contractor not satisfactorily control the transmission of any dirt to the roadway.
- F. Any damages to areas outside the site, spills of soil, liquid, or any other material shall immediately be repaired, cleaned and restored to its previous condition.
- G. The Owner reserves the right to back charge the Contractor for all costs associated with maintaining the grounds as well as maintaining areas outside the site, which may be disturbed by the Contractor should the Contractor fail to maintain or repair the aforementioned in a condition acceptable to the Owner.
- H. The Contractor shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibility of the Contractor.
- I. Contractor shall be responsible for protecting private property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any

removals or relocation of said objects, if allowed shall be as directed by the Architect/Engineer or District. Contractor shall protect all of the physical structures, property and improvements from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.

- J. Keep all existing driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the work area with materials and equipment.
- K. The Contractor is responsible for cleaning up the work area. Failure to maintain a clean work site daily, will result in others performing the work and the Contractor being back charged for the cleaning cost plus construction administration fees.

### 1.03 CONTRACTOR USE OF THE PREMISES

- A. Premises, for the purpose of this Contract, shall mean the site, buildings and other structures located within the property line or in any temporary or permanent construction easements identified on the plans.
- B. The Contractor shall use and manage the premises and the associated construction activities as follows:
  - 1. To not hinder the Owner's ability to operate their facilities. \_\_\_\_\_
  - 2. To allow for stockpiling of construction material and debris without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
  - 3. To allow for the stockpiling of excavated soil and imported fill, when called for, without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
  - 4. To allow utility companies to install their work.
  - 5. To allow for the delivery of equipment and materials by independent trucking companies by leaving enough space for backing in and out of areas.
  - 6. To allow for the safe, unimpeded travel way of the Owners vehicles, Owner's Construction Representative's vehicles, Architect/Engineer's vehicles, construction vehicles and heavy construction equipment about the entire site.
- C. Contractor shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibility of the Contractor.
- D. The Contractor shall be responsible for protecting Owner's property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any removals or relocation of said objects, if allowed shall be as directed by Owner's Construction Representative.
- E. The Contractor shall protect all of the physical structures, property and improvements upon the site from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.
- F. Keep all existing operations areas, driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the site with materials and



equipment. Confine stockpiling of excess excavated material, materials and equipment to areas selected under the Site Utilization Plan or as designated by the Owner's construction representative. Locate storage sheds and trailers to areas designated in the plan or by the Owner's Construction Representative.

- G. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.
- H. The construction site space is limited and it shall be the General Contractor's responsibility to manage the site during the entire construction period with input from all concerned parties as to meeting their needs. Equal consideration of the needs of others with that of the Contractor's shall be provided as judged by the Owner.
- I. The Contractor is responsible for cleaning up their own materials and debris. Failure to maintain a clean work site daily, will result in other performing the work and The Contractor being back charged for the cleaning cost plus construction administration fees.
- J. Use of the existing building facilities during construction is prohibited including but not limited to: toilet rooms, telephone and water fountains. The Contractor shall be fined (\$250) per occurrence if their employee (or subcontractor's employee) is observed disregarding these rules.
- K. Should it become necessary to access the existing building during construction hours for measurements or other non-disruptive work, the contractor shall be escorted by an Owner's Construction Representative.
- L. Do not discard or dispose of any waste on-site.
- M. Open fires will not be permitted on the site.
- N. The Contractor shall employ erosion control measures to protect wetlands located adjacent to the work where shown on the Drawings and as required by regulatory agencies.
- O. Install erosion control measures as indicated in the Contract. The Contractor shall confine stormwater runoff to the site.

#### 1.04 CONTRACTOR STORAGE, PARKING AND DELIVERIES

- A. Contractor must provide exterior storage containers when required. Final location of storage container shall be determined by the Owner.
- B. Do not unreasonably encumber the premises with materials and equipment. Do not store material in existing buildings. Store all equipment and materials to allow the Owner's employees to operate and conduct their business safely.
- C. Confine premise storage areas to locations designated by the Owner. Immediately repair or replace damaged facilities to the satisfaction of the Owner and to a condition that existed before the damage occurred as determined by preconstruction photographs, or if photographs are unavailable, to that deemed by the Owner.
- D. No materials storage will be permitted within the buildings at any time during construction.
- E. Storage of chemicals and paint materials shall be outside the existing or new structures and shall follow manufacturer's storage/handling guidelines.
- F. Compressed gas containers shall be properly stored and secured per OSHA, to the satisfaction of the Owner. Failure to do so will result in a \$250 back charge, per occurrence.

- G. Contractor shall provide minimum of 48 hours advance written notice to the Owner's Construction Representative for deliveries of materials, site visits by inspectors, manufacturer's representatives or any other occasion that impacts the use of the site. Contractor shall be responsible for any costs that are incurred by the owner, for failure to meet previously agreed upon appointments or work schedules.
- H. Deliveries sent to the Owner will not be signed for or unloaded by the Owner. They will be directed to the construction site and if no employee is on site, the delivery will be rejected, at the contractor's expense.
- I. Night deliveries of equipment (past the designated quitting time) will not be permitted. Do not schedule trucking companies to deliver equipment or wait for the job site to open. Delivery trucks shall not obstruct the site entrance, shall not sit within the neighborhood causing an obstruction or perceived nuisance, nor be left idling on or off the site for any period of time.
- J. Parking shall be in the designated areas of the site only. All automotive type vehicles are to be locked when parked or unattended to prevent unauthorized use. Do not leave vehicles or equipment unattended with the motor running or the ignition key in place. Any vehicles or trucks in non-designated areas may be towed at contractor's expense.

#### 1.05 WORK HOURS, EMPLOYEE CONDUCT AND MISCELLANEOUS EMPLOYEE REQUIREMENTS

- A. The Contractor will be permitted to schedule working days and hours as specified in the General Terms and Conditions, if no times are specified therein then the work hours shall be Monday - Friday 8:00 am - 4:00 pm.
- B. Employees are to act in a professional manner. Any employee using inappropriate language or who is disruptive to the work environment will be banned from the site.
- C. Proper work attire is required. Shirts are to be worn at all times and no short pants are permitted.
- D. Employees shall not converse with local residents or Owner's employees.
- E. Any employee found under the influence of any drug or alcohol will be banned from the site.
- F. The Contractor shall schedule working days and hours as specified. The contractor shall pay all excess costs for working beyond the times specified. This includes the cost of the owner's employees to keep the building/site open and/or the cost of the additional services for the construction manager.

#### PART 2 - PRODUCTS

NOT USED

#### PART 3 - EXECUTION

NOT USED

**END OF SECTION 011400**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Site Utilization Plan requirements

1.02 SITE UTILIZATION PLAN REQUIREMENTS

- A. The Contractor shall prepare a Site Utilization Plan (SUP) showing staging areas, parking areas, stockpile areas, debris container areas, unloading areas, and trailer areas for review by the Architect/Engineer and Owner's Construction Representative. The length and number of meetings necessary to develop and adopt a SUP shall be as required.
- B. The Contractor, by submitting a bid, understands the importance of a workable Site Utilization Plan and also understands that the Owner's Construction Representative may be required to select a plan for the contractor to adopt that is not ideal to the planned construction activities anticipated before the bid was submitted. There shall be no claims for damages associated with site utilization.

**END OF SECTION 011419**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Allowance pricing for the following items:
  - 1. Independent Laboratory Testing Allowance.
  - 2. Contingency Account.
- B. This Section covers the requirements for use of the cash allowances listed above contained in the proposal (Bid Forms, Price Schedule) and included in the Contract Price bid by the Contractor and defines and stipulates the charges that will be paid for out of the stipulated allowances.
- C. The Contractor shall include the cash allowances stipulated in this Section in the amount bid (Base Bid).
- D. Eligible costs described in this Section, and Sections referenced herein, will be the only costs paid for out of the stipulated allowances.
- E. All other costs associated with the project as specified and/or shown, including but not limited to the delivery, installation and all Contractor overhead and/or collateral expenses are to be distributed among the other portions of the work and shall be included in the lump sum base bid.

## 1.02 SUBMITTALS

- A. Make all submissions under the provisions of Section 013300.
- B. For each type of product/material specified to be furnished under allowance pricing provide documentation of the unit pricing on manufacturer's letterhead certifying pricing of the product/material.
- C. Submit additional backup information to substantiate the invoiced amount(s) as the Architect/Engineer may require for review and approval, prior to order or payment of item.
- D. Provide written breakdowns for extra work as the Owner may require.

## 1.03 PAYMENTS TO BE MADE OUT OF TESTING ALLOWANCE

- A. Include the cash allowance amount indicated in the proposal for independent testing laboratory services specified in Section 014500.
- B. The actual invoiced charges of the testing laboratory, including testing companies where called for, incurred for field and laboratory tests, as specified only in Section 014500 - Quality Control, shall be paid for out of the cash allowance.
  - 1. Any other requirement specified herein throughout these specifications for providing the services of an independent testing laboratory, underground utility location company, or similar outside independent service are to be borne by the Contractor.
- C. One (1) week prior to each partial payment, submit a certified invoice from each company listing and detailing the total costs incurred since the last invoice.
  - 1. The invoice shall be on company letterhead signed by an authorized representative of the company and shall include man-hours, tests conducted, date of tests and associated costs and fees.

2. Payment for costs will not be made unless the information is provided and certified.  
Payment for costs will not be made unless the typed test data reports have been received by the Architect/Engineer.
- D. If in the event test results (provided by the independent testing laboratory) show non-compliance with these specifications, then at the option of the Contractor and only with the approval of the Owner, he may re-test samples to verify the original test results at his/her own expense.
- E. Costs for re-testing failed components of the work, when ordered by the Architect/Engineer, will not be paid for out of the cash allowance and will be directly borne by the Contractor.

#### 1.04 PAYMENTS TO BE MADE OUT OF CONTINGENCY ACCOUNT

- A. Include the cash allowance as shown in the proposal, in the amount bid for use upon the Owner's instructions.
- B. The Owner will draw funds from the contingency account only upon prior written approval by the Owner's Construction Field Representative and Architect/Engineer.
- C. Funds remaining at project closeout shall be credited to the Owner.

#### PART 2 - PRODUCTS

NOT USED

#### PART 3 - EXECUTION

NOT USED

**END OF SECTION 012100**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Submission procedures.
- B. Documentation of changes to Contract Sum/Price and Contract Time.

## 1.02 RELATED SECTIONS

- A. Proposal Form.
- B. Other sections referencing this section.
- C. All contractual requirements outlined in the documents.

## 1.03 SUBMISSION REQUIREMENTS

- A. Submit Alternates on Proposal Forms identifying the effect on adjacent or related components.
- B. Alternates will be reviewed and accepted or rejected at the Owner's option.
- C. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

## 1.04 SELECTION AND AWARD OF ALTERNATES

- A. Indicate variation of Bid Price for Alternates listed on the PROPOSAL FORM. This form requests a "difference" in Bid Price by adding to or deducting from the base Bid Price.
- B. Alternates quoted on PROPOSAL FORM will be reviewed and accepted or rejected at Owner's option.
- C. Bids will be evaluated on the base bid price, plus any combination of alternate items.

## 1.05 WORK FOR ALTERNATES

- A. Work for alternate items selected shall include all related materials, labor, equipment and operations necessary to conduct and complete the alternate work and all other affected work or adjacent areas.
- B. There shall be no change in time or completion date for the selected alternates, unless specified herein or approved in writing by the Architect/Engineer and Owner.
- C. Alternates and associated work shall meet all standards and specifications delineated in the Contract Documents.
- D. Contractor shall coordinate pertinent related Work and modify surrounding Work as required to complete the project under each alternate selected by the Owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROCEDURES

- A. Work for each alternate, related items and collateral work shall be completed in their entirety.
- B. If alternate items are not selected, work for the base bid and collateral work shall be completed in their entirety.

**END OF SECTION 012300**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section includes the requirements for substitution of specified products during construction.
- B. *The Architect will consider requests for substitutions only within **two (2)** business days following the Bid Opening.*
- C. Products named by the Bidder, at the time of bid, shall be furnished and installed and substitutions will not be considered by the Owner/Architect/Engineer for those products named in the bid.

## 1.02 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select any product meeting that standard.
- B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the Specifications.
- C. Where products are not named, then submit products that meet the specifications.

## PART 2 - PRODUCTS

## 2.01 SUBSTITUTIONS

- A. Name - The Drawings and Specifications list acceptable manufacturers, commercial names, trademarks, brands and other product, material and equipment designations. Such names are provided to establish the required type, quality and other salient requirements of procurement.
- B. Equals - An item equal to that named or described on the Drawings or in the Specifications may be provided by Contractor if accepted by the Architect/Engineer.
- C. A request for product substitution constitutes a representation that the Contractor:
  - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
  - 2. Shall provide the same warranty for the Substitution as for the specified Product.
  - 3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by material suppliers and vendors.
  - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 5. Shall reimburse the Owner and the Architect/Engineer for review or redesign services associated with re-approval by authorities.
  - 6. Shall reimburse the Owner for all additional engineering services claimed by the Architect/Engineer for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Architect/Engineer's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Substitution Submittal Procedure:



1. The Contractor shall use the form included within this Section.
2. All forms shall be type written.
3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.

- F. The burden to prove product equivalence rests on the Contractor.
- G. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request and at that time the Contractor can make a formal submittal in accordance with the requirements contained in Section 013300.
- H. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- I. Refer to the general conditions for additional requirements.

## 2.02 SUBSTITUTIONS OF ENGINE GENERATOR, AUTOMATIC TRANSFER SWITCH AND GENERATOR ENCLOSURE

- A. Bidders considering substitute engine generator systems, transfer switches and generator enclosure manufacturers not listed in the specifications shall provide complete submittal data for review and acceptance, as indicated in the specifications, no later than 10 days after the bid date. No substitute equipment manufacturers will be considered accepted or reviewed after this date.
- B. All proposed substitutions shall be submitted by the bidder. Any proposed substitutions submitted directly by supplier and/or manufacturers will not be reviewed or returned.
- C. Acceptance of Substitute Equipment: If accepted, the contractor shall be responsible for all additional costs for generator concrete foundation, any necessary revisions to plans and specifications, drawings and project documentation; and changes related to equipment spacing, pad sizes, mounts, electrical wiring, ventilation equipment, fuel, exhaust components, etc., as well as any engineering costs, resulting from said substitution. If a brand name other than that specified is proposed for use, the supplier must provide a locally available system for the Owner and Engineer to review and inspect, as well as witness testing to show compliance with the specifications. Also, the supplier must furnish a list of completed installations, including name, address and telephone number of at least five comparable installations which can prove the proposed products have operated satisfactorily for three years.

## PART 3 - EXECUTION

NOT USED

**This space left intentionally blank.**

**REQUEST FOR SUBSTITUTION FORM**Project: VGFD2001-New Firehouse Substitution Request Number: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

To: \_\_\_\_\_ Date: \_\_\_\_\_

H2M Project Number: VGFD2001 Owner: Vails Gate Fire District

Contract Name: \_\_\_\_\_ Contract No.: \_\_\_\_\_

Specification Title: \_\_\_\_\_

Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Drawing No(s): \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_

Trade Name: \_\_\_\_\_ Phone #: (\_\_\_\_) \_\_\_\_\_

Installer: \_\_\_\_\_ Address: \_\_\_\_\_

Phone #: (\_\_\_\_) \_\_\_\_\_

History: \_\_\_ New product \_\_\_ 2-5 years old \_\_\_ 5-10 years old \_\_\_ More than 10 years old

Differences between proposed substitution and specified product:

\_\_\_ Point-by-point comparative data attached

Reason for not providing specified item (Attach separate sheet if necessary):

**Typical Similar Installation:**

Project: \_\_\_\_\_

Engineer / Architect: \_\_\_\_\_

Address: \_\_\_\_\_

Owner: \_\_\_\_\_

Date Installed: \_\_\_\_\_

Submit complete installation list on separate sheets.

Proposed substitution affects other parts of Work: ☐ No ☐ Yes

Explain: \_\_\_\_\_

Gross Savings to Owner for accepting substitution: \$ \_\_\_\_\_

Proposed substitution changes Contract Time: ☐ No ☐ Yes

Add / deduct (circle): \_\_\_\_\_ days

Supporting data attached for evaluation of the proposed substitution:

☐ Product Data ☐ Photos ☐ Drawings ☐ Tests ☐ Reports ☐ Samples☐ Other (explain): \_\_\_\_\_

Attached data includes description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified.

Attached data also includes a description of changes to Contract Documents that proposed substitution will require for its proper installation.

**The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:**

1. Proposed Substitution has been fully checked and coordinated with Contract Documents.
2. Proposed Substitution does not affect dimensions shown on Drawings.
3. Proposed Substitution does not require revisions to any other Prime Contractor's work.
4. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.
5. Proposed Substitution will have no adverse affect on other trades, construction schedule, or specified warranty requirements.
6. Maintenance and service parts will be locally available for proposed substitution.
7. The undersigned further states that the function, appearance, and quality of proposed Substitution are equivalent or superior to specified item.

**This request for product substitution also constitutes a representation that I, as the Contractor:**

1. Has investigated proposed Product and determined that it meets or exceeds the quality of the specified Product.
2. Shall provide the same warranty for the Substitution as for the specified Product.
3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Shall reimburse the Owner and the Architect/Engineer for review or redesign services associated with re-approval by authorities.
6. Shall reimburse the Owner for all additional engineering services claimed by the Architect/Engineer for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Architect/Engineer's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

Contractor's Authorized Representative (Typewritten): \_\_\_\_\_

Authorized Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**END OF SECTION 012500**

## PART 1 - GENERAL

## 1.01 DESCRIPTION

- A. Work under this Section specifies the procedures used to process partial payments and the Final Payment Request.

## 1.02 TIME FOR COMPLETION

- A. Inasmuch as the provisions of the Contract relating to the time for performance and completion of the Work are for the purposes of enabling the Owner to proceed with the construction of an improvement in accordance with a predetermined program, and inasmuch as failure to complete the Work within the period herein specified may result in damage or loss to the Owner, time is of the essence of the Contract.
- B. Time for completion of the Work shall be in accordance with that stipulated in the Contract Documents.
- C. The date for completion will be calculated from the date shown on the Notice to Proceed. The Contractor shall execute the Work with diligence from day to day, and complete it within the time fixed.
- D. For the purpose of defining the date of substantial completion, the Project will be considered complete when all Work covered by the Contract has been performed and all installations and equipment have been tested and are ready for permanent use. Contractor shall provide a copy of the final Certificate of Occupancy from the AHJ prior to issuance of the final payment. Removal of the Contractor's plant and equipment and other minor adjustments which do not prevent use of the Project will not be a factor in establishing the date of substantial completion.
- E. Notwithstanding the foregoing, the Architect/Engineer will establish the date of substantial completion when the project is accepted and ready for operation, and no large or major items of work are as yet outstanding. At such time, the Architect/Engineer will issue a punch list, itemizing the items of work remaining. The punch list will include "minor" items only, as defined solely by the Architect/Engineer. Any prior punch lists, which include "major" or significant items, as defined by the Architect/Engineer, shall not be a criterion in establishing the date of substantial completion.

## 1.03 PARTIAL COMPENSATION

- A. At the Owner's discretion, the Contractor may receive compensation for materials and products delivered to the site yet not installed providing:
  - 1. A canceled check or paid bill from the supplier is submitted to the Architect/Engineer indicating that the Contractor has paid the supplier for the material or equipment.
  - 2. The material or piece of equipment is properly stored and protected from the elements and/or vandalism in accordance with the manufacturer's written requirements for long term storage.
  - 3. A certificate of insurance is provided for the material or piece of equipment in the event of a fire, vandalism, theft, etc.
  - 4. A bill of material is delivered to the Architect/Engineer at the time of delivery itemizing the subject material or equipment. Payment will be made for on-site material and/or equipment in the amount of 80% of the gross amount of the paid invoice. This payment will be subject to the normal retainage of the partial estimate.
  - 5. The Architect/Engineer has agreed to the pre-purchasing of the materials.
- B. The Contractor may not receive compensation for materials and products stored in the Contractor's yard or shop unless permitted by the Owner.

## 1.04 APPLICATIONS FOR PAYMENT

- A. The Contractor shall review the percentage of work completed during the payment period with the Architect/Engineer, based on the bid items in the proposal. The Architect/Engineer shall make the final decision on the percentage of work completed.
- B. The form of application for payment shall be AIA Document G702, application and certificate for payment supported by AIA Document G703, Continuation Sheet.
- C. Submit one (1) copy of each payment application, completed, signed and notarized.
- D. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- E. The payment application shall include a Contractor Invoice and an Owner Claim Voucher.
- F. Provide completed Labor Affidavit Form for each pay period included in the certified payroll reports for each payment application for both the contractor and any subcontractor(s).
- G. Submit payment application to Architect/Engineer no later than the first day of each month. Payments received after the first day of each month shall be reviewed and processed after the first day of the following month. Only one application for payment will be reviewed and processed each month.
- H. Submit certified payroll receipts for all workers and subcontractors. Payroll receipts shall be submitted with every application for payment. All payroll receipts shall be certified correct and notarized by a Notary in the State of New York. Application for Payment will not be processed unless all payroll receipts are received.
- I. Contractor shall pay all workers and have all subcontractors pay all workers as per the Project Labor Agreement, see Appendix B.
- J. Owner may conduct on-site interviews with all workers to verify payments of wage rates are enforced.
- K. The Architect/Engineer shall submit the documentation along with an Architect/Engineer's Payment Report to the Owner for payment.
- L. Retainage in the amount of 5% will be held from each partial payment. Retainage will only be released upon full completion of the project and will be included in the final payment.

## 1.05 ACCEPTANCE OF FINAL PAYMENT REQUEST

- A. The Contractor shall be conclusively deemed to have accepted the Final Payment Request as a correct statement of the total liability of the Owner and of the compensation paid and to be paid to the Contractor by the Owner unless within seven (7) days after delivery of his copy of the Final Payment Request to him, the Contractor shall return such copy to the Owner together with a statement of his objections to such request and of any claim for damages or compensation in excess of the amounts shown on the Request. The acceptance by the Contractor of the Final Payment Request approved by the Owner shall constitute a release and shall discharge the Owner from all further claims by the Contractor arising out of or relating to the Contract, including but not limited to, a release from all impact costs.

## 1.06 SCOPE OF PAYMENTS

- A. The Contractor shall receive and accept the compensation as herein provided, in full payment for furnishing all materials, labor, tools, and equipment and for performing all work contemplated

and embraced under the Contract, also for all loss or damage arising out of the nature of the Work or from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the Work, and for all risks of every description connected with the prosecution of the Work, until its final acceptance by the Owner, also for all expenses incurred by, or in consequence of, the suspension or discontinuance of the said prosecution of the Work as herein specified, and for all actual or alleged infringements of patent, trademark, or copyright, and for completing the Work and the whole hereof, in an acceptable manner, according to the Plans, Specifications, and other Contract Documents. The payment of any partial or final estimate shall in no way or in no degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to renew or replace all defects and imperfections, or damages. The Architect/Engineer shall be the judge, and the said Contractor shall be liable to the Owner for failure so to do.

**PART 2 - PRODUCTS**

NOT USED.

**PART 3 - EXECUTION**

NOT USED.

**END OF SECTION 012900**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Schedule of Values

## 1.02 SCHEDULE OF VALUES

- A. Submit for approval prior to the start of the work a Schedule of Values that indicates a breakdown of the labor, materials and equipment and other costs used in the preparation of the bid. This schedule shall be in sufficient detail to indicate separate figures for such items as excavation, concrete, equipment and all other items making up the lump sum price. The cost breakdown shall be separately itemized for each lump sum bid item in the project.
- B. Where the cost breakdown includes items for bond payment, insurance payment, job set-up, or job mobilization, these items will be paid based on paid invoices and copies of cancelled checks.
- C. Submit a Schedule of Values to the Architect/Engineer for review and approval within fifteen (15) calendar days from the date shown on the Notice to Proceed.

## 1.03 FORM OF SUBMITTAL

- A. Submit typewritten Contract Cost Breakdown on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or EJCDC 1910-8-E. The Architect/Engineer reserves the right to revise the form or provide a form prepared by the Architect/Engineer.
- B. Use the Table of Contents of the Contract Specifications as a basis for format for listing costs of work for Sections under Divisions 01-48 as sections apply to work. Not all Sections need be assigned a breakout price as determined by the Architect/Engineer.
- C. Identify each line item with number and title as listed in Table of Contents.
- D. Provide dollar values for each line item for labor, overhead, profit, material, and equipment components for each category of work if requested by the Architect/Engineer.
- E. List quantities of materials specified under unit price allowances.
- F. The Schedule of Values, after approval by the Architect/Engineer, shall be the basis for the Contractor's Application for Payment.
- G. The first Application for Payment will not be reviewed prior to an approved breakdown.

## 1.04 PREPARATION OF SCHEDULE OF VALUES

- A. In addition to the above, provide a separate line item cost for each of the following items which shall be supported by proof where requested by Architect/Engineer:
  - 1. Performance and payment bonds.
  - 2. Insurance.
  - 3. Mobilization and Demobilization (Amounts shall be equal in value).
  - 4. Temporary facilities and measures as specified in Section 015000.
  - 5. Project Coordination Meetings as specified in Section 013100.
  - 6. All Cash Allowance items as contained in Section 012100.
  - 7. On-site, full time superintendent starting on the date of the Notice To Proceed and ending on the date that all punch list items are completed, which for the purposes of the Schedule of Values, shall be the contract completion date.



- 8. Final cleaning.
- B. Show total costs including overhead and profit.
- C. Provide additional details and data to substantiate the cost breakdown as requested by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**END OF SECTION 012973**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Work of this Section includes:
  - 1. Requests for Interpretation or for information
  - 2. Administration of subcontracts
  - 3. Coordination of work with utility companies and the Owner/Architect/Engineer
  - 4. Communication and coordination requirements
- B. Site staffing requirements for the Contractor's superintendent are also specified herein, the costs for which shall be included in the Contract price.

## 1.02 REQUEST FOR INTERPRETATION OR INFORMATION

- A. The Contractor shall use the Request for Interpretation/Information Form included within this Section when the Contractor feels that additional information is needed to perform the work of the Contract.
- B. The Architect/Engineer will respond to requests utilizing the form provided herein.
- C. The Architect/Engineer's verbal response(s) to the Contractor's formal requests, if provided, shall not constitute an official response and if acted upon by the Contractor are done so at the Contractor's own risk and liability and shall not be subject to claims for additional compensation.
- D. A signed facsimile of the form will be accepted. The original of the form must be signed and provided to the project manager.
- E. The Architect/Engineer will respond in writing to the request as soon as possible.

## 1.03 SUBCONTRACTOR ADMINISTRATION AND COORDINATION

- A. Terms and conditions of the Contract shall be binding upon each subcontractor.
- B. Furnish each subcontractor and major equipment vendor at least one (1) copy of the Plans and Technical Specifications.
- C. Provide at least one (1) copy of each approved shop drawing to each subcontractor whose work may depend upon the contents of the shop drawing submittal. The Owner reserves the right to stop all work, without claims for delay, until such time as appropriate subcontractors are furnished with appropriate shop drawings.
- D. The Contractor shall sequence and schedule the work of subcontractors. Coordinate construction and administration activities of subcontractors. The Architect/Engineer and Owner will not accept telephone calls, facsimiles or office visits from any subcontractors on the project. Subcontractor and vendor questions and clarifications shall be directed to the Architect/Engineer by the Contractor.

## 1.04 UTILITY COORDINATION

- A. Comply with the requirements of 16 NYCRR Part 753 - Protection of Underground Facilities. Submit a letter stating the case number.

## 1.05 PUBLIC/PRIVATE UTILITIES

- A. Notify all public and private utilities in accordance with Article 20, Section 322-a of the New York State General Business Law for location and markout of existing utilities in the vicinity of the work.
- B. Repair all utilities damaged during the Work to the standards and approval of the respective utility at no cost to the Owner.

## 1.06 SPECIFIC COORDINATION REQUIREMENTS

- A. Coordinate space requirements, supports, and installation of mechanical, electrical and plumbing work which may be indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable. Place runs parallel with building lines. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and to facilitate repairs.
- B. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of all fixtures and outlets with finish elements and work by all other trades.

## 1.07 CONTRACTOR'S JOB SITE SUPERINTENDENT

- A. The Contractor shall employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.
- B. The Contractor shall name the job site superintendent within five (5) days of the Notice To Proceed. A letter to the Architect/Engineer shall be provided.
- C. The Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.
- D. The superintendent shall not be a foreman or crew supervisor.
- E. The superintendent shall be qualified to perform the duties so required to successfully complete the work in accordance with the Contract Documents.
- F. The superintendent shall speak English. If required by the Architect/Engineer, provide a resume for the proposed superintendent that shall be typed and shall list the qualifications of the superintendent. Prior to the Contractor assigning a superintendent to the project, he may wish to arrange an interview with the Architect/Engineer to determine the proposed superintendent's ability to properly coordinate the work through the Owner/Architect/Engineer. The Contractor shall employ a superintendent acceptable to the Owner.

THIS SPACE LEFT INTENTIONALLY BLANK.

REQUEST FOR INTERPRETATION/INFORMATION (RFI)

OWNER'S NAME: Vails Gate Fire District

PROJECT NAME &amp; CONTRACT DESIGNATION: VGFD2001-New Firehouse

CONSTRUCTION CONTRACT NO.: VGFD2001

|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------|
| Product, Item, or System:                                                                                                                                                                                                                                                                                                            |  |                                                                              |
| Request Date:                                                                                                                                                                                                                                                                                                                        |  | RFI No.:                                                                     |
| Specification Section:                                                                                                                                                                                                                                                                                                               |  | Paragraph Ref:                                                               |
| Contract Drawing Reference(s):                                                                                                                                                                                                                                                                                                       |  |                                                                              |
| Describe Request:                                                                                                                                                                                                                                                                                                                    |  |                                                                              |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
| Signed:                                                                                                                                                                                                                                                                                                                              |  | See Contractor's Attachments for Additional Description for Information      |
| Owner/Architect/Engineer Response:                                                                                                                                                                                                                                                                                                   |  |                                                                              |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                                              |
| Architect/Engineer (Printed):                                                                                                                                                                                                                                                                                                        |  | See Architect/Engineer's Attachments for Additional Information              |
| Architect/Engineer's Signature & Date                                                                                                                                                                                                                                                                                                |  | <i>Response Accepted By Contractor<br/>Contractor's Signature &amp; Date</i> |
| <p>The Work shall be carried out in accordance with these supplemental instructions without change in Contract amount or Contract time for completion. Prior to proceeding with these instructions, indicate your acceptance of these instructions by signing where indicated and returning this form to the Architect/Engineer.</p> |  |                                                                              |

**END OF SECTION 013100**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for progress meetings.

## 1.02 PRE-CONSTRUCTION CONFERENCE

- A. The Contractor is required to attend the pre-construction conference at a location, date, and time selected by the Owner.
- B. The owner, a partner, or a corporate officer representing each Contractor shall attend the conference. The job site superintendent and office project manager for each Contractor shall also attend.
- C. The Architect/Engineer will prepare an agenda for the conference.

## 1.03 PROGRESS MEETINGS

- A. Progress meetings will be held approximately once every two (2) weeks during actual times on construction. The Owner may elect to hold meetings more or less frequently.
- B. At least seven (7) calendar days advance notice will be given by the Architect/Engineer or the date for the upcoming meeting will be set during the progress meeting.
- C. Attendance at progress meetings shall be mandatory. An amount of \$1,000 shall be deducted from the Contract Amount for each announced meeting not attended by the Contractor.
- D. The owner, a partner, or a corporate officer representing the Contractor shall attend each announced progress meeting. The job site superintendent and office project manager for each Contractor shall also attend.
- E. Subcontractors shall attend when requested by the Owner or Architect/Engineer at no cost to the Owner.
- F. Meetings will be conducted by Architect/Engineer at a location selected by the Owner, normally at or adjacent to the project site.
- G. The minimum agenda will cover:
  - 1. Review minutes of previous meetings.
  - 2. Identify present problems and resolve them.
  - 3. Plan work progress during next work period.
  - 4. Review the status of off-site fabrication and delivery schedule.
  - 5. Review shop drawings and submittal schedules.
  - 6. Review change order status.
  - 7. Review status of construction progress schedule.
  - 8. Coordinate access requirements.
  - 9. Other business related to the work.

## 1.04 OTHER MEETINGS

- A. Attend special meetings which may be required or called for by Federal, State or Local authorities, utility companies, Owner, Architect/Engineer or any other firm, person or organization related to the project.

## 1.05 CONDUCTING MEETINGS

- A. General - This paragraph covers Owner and/or Architect/Engineer meetings with Contractor and/or his subcontractors. Neither Owner nor Architect/Engineer wishes to meet solely with a subcontractor and requests for such meetings will be discouraged. If a meeting is deemed necessary, every effort will be made to have Contractor attend. If, for some reason, circumstances do not allow such, the meeting may be held, minutes of the meeting will be sent to contractor and decisions on any major questions will be reserved until contractor has been consulted. Subcontractors may accompany contractor to meetings provided contractor notifies Architect/Engineer in advance.
- B. Chairman - When Architect/Engineer/Owner attend meetings, Architect/Engineer, or his duly authorized representative, will act as chairman. Should Owner-Contractor meetings be necessary, Owner will chair such meetings.
- C. Notices - Architect/Engineer or Owner will issue notices of meetings to all parties concerned and will note, thereof, who must attend and who may attend if they so desire. When a Contractor desires a formal meeting, make a request through Architect/Engineer. Except when Architect/Engineer determines that a prompt meeting is essential, all notices will be issued at least one week in advance of the meeting date.
- D. Agenda - All parties shall inform Architect/Engineer of items desired to be discussed and Architect/Engineer will notify all parties of all items to be considered. This is to allow each party to fully prepare for the meeting. This shall not be construed to mean that other items cannot be brought up at the meetings.
- E. Time Limits - It is the intent to hold productive and efficient meetings and to keep them as short as is reasonably possible. The Chairman will be the sole judge as to whether or not further discussion on any matter is warranted and all discussions shall cease when he so orders.
- F. Minutes - Minutes of meetings will be kept, written and distributed by the Chairman or his duly authorized representative. Minutes of all meetings will be available upon request to the Chairman.
- G. Conduct - It is the intent to conduct all meetings in an orderly manner, to reasonably discuss all items and to hear and observe the rights and opinions of all parties. The Chairman will allow each party to speak, however, he reserves the right to order any individual to leave the meeting at any time for any reason.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

NOT USED

**END OF SECTION 013119**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section specifies the requirements for preparing construction schedules and for keeping them up to date.

## 1.02 CONSTRUCTION SCHEDULE - GENERAL

- A. Coordinate the work and maintain the construction schedule. In the event actual progress begins to lag the schedule, promptly employ additional means and methods of construction to make up the lost time.
- B. Keep the construction schedule current and revise and resubmit as often as necessary to accurately reflect the conditions of the work, past progress and anticipated future progress.
- C. The construction schedule shall be completed, submitted, and deemed received by the Architect/Engineer prior to the first payment application.
- D. The schedule, when approved by the Architect/Engineer and the Owner, shall establish the dates for starting and completing work for the various portions of the Contract. It shall be the duty of the Contractor to conform to his/her own schedule and to perform the work within the time limits indicated. Failure to adhere to the approved schedule shall expose the Contractor to disputes, claims and additional costs incurred by others.
- E. Coordinate letting of subcontracts, material purchases, shop drawing submissions, delivery of materials, and sequence of operations, to conform to the schedule.
- F. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.
- G. The schedule shall show the critical sequence items where new units must come online before existing facilities go offline, if applicable to the project. The schedule shall also show, in detail, the proposed sequence of the work and the estimated date of starting and completing each stage of the work in order to complete the project within the contract time.
- H. The schedule shall be plotted out in color and shall be 11-inch by 17-inch. It shall contain as many sheets as are necessary to show all rolled down tasks. Partially printed schedules will not be accepted. Each Contractor shall arrange to have it plotted on a color plotter suitable for the intended application.
- I. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- J. The schedule shall use the following convention:
  - 1. Tasks for the General Contractor in blue ink.
  - 2. Task links/task dependency in blue ink.
  - 3. Work by others in green ink.
  - 4. Milestone dates (zero duration) by a red diamond.
  - 5. The end date for each task and subtask at the end of a bar.
  - 6. The description of all major tasks within the bar. The bar shall be red.
  - 7. Critical path.
- K. The construction schedule shall also show the following:
  - 1. Critical sequence items where new units must come on-line before existing facilities go off-line, if applicable to the project.

2. Lead time for control panels that are packaged as systems.

### 1.03 REVISION OF PROJECT PROGRESS SCHEDULE

- A. The Contractor shall evaluate and provide updated construction schedules monthly in accordance with job requirements. Each update shall be submitted to the Architect/Engineer for information purposes and be provided by the last Friday of every month
- B. The Contractor shall modify his construction schedule to accommodate coordination of the construction contracts by the Owner/Architect/Engineer without claims for additional compensation or delay.
- C. The Architect/Engineer will provide an electronic version of the Final Combined Construction Schedule for use in keeping the schedule up to date.
- D. From time to time, and at stages deemed appropriate by the Architect/Engineer, the Architect/Engineer may issue updated schedules to reflect the project's status. The percent complete for each task may be shown, as determined by the Architect/Engineer.

### PART 2 - PRODUCTS

NOT USED

### PART 3 - EXECUTION

NOT USED

**END OF SECTION 013216**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Project record documents shall be prepared as specified herein.

## 1.02 QUALITY ASSURANCE

- A. The Contractor shall employ a land surveyor licensed in the State where the project is located. The surveyor shall be acceptable to the Architect/Engineer in terms of experience and qualifications.
  - 1. Submit evidence of the surveyor's errors and omissions (professional liability) insurance coverage in the form of an insurance certificate.
  - 2. The surveyor shall maintain a minimum coverage of \$1,000,000 for professional liability.
  - 3. The Owner, Architect/Engineer, and Contractor shall be named as insurance certificate holders.
  - 4. A thirty-day cancellation notice shall be provided.
  - 5. Physical work shall not be performed until the certificate is provided and approved by the Owner.
- B. All instruments used on the project shall be of professional quality and in first class condition.
  - 1. All instruments shall have been calibrated by a manufacturer's service station within the last twelve (12) months.
  - 2. Submit certificate of calibration or paid invoice showing that the unit has been calibrated, if so required by the Architect/Engineer.

## 1.03 SUBMITTALS FOR REVIEW

- A. Submit name, address, and telephone number of Surveyor before starting survey work.
- B. Surveyor's professional liability insurance certificate.
- C. On request, submit documentation verifying accuracy of survey work.
- D. Submit a copy of the site drawing signed by the land surveyor showing locations of other benchmarks set by the surveyor, baseline location and offset hubs. If requested, the Architect/Engineer will provide a reproducible drawing or a drawing in digital format for use by the surveyor.

## 1.04 EXAMINATION

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect/Engineer of any discrepancies discovered.

## 1.05 SURVEY REFERENCE POINTS

- A. The Contractor's surveyor shall locate and protect survey control and reference points located throughout the project site.
- B. Control datum for survey is that indicated on the Drawings or will be provided by the Architect/Engineer.
- C. The Contractor shall protect survey control points prior to starting any site work. Preserve permanent reference points during construction.

- D. Promptly report to the Architect/Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
  - 1. The surveyor shall replace dislocated survey control points based on original survey control when directed by the Architect/Engineer.
  - 2. Make no changes without prior written notice to Architect/Engineer.
- E. The surveyor shall set control lath for rough and final grading purposes. Lath shall be placed at sufficient intervals to control grade or as directed by the Architect/Engineer.
- F. All new structures, pits, chambers, drainage pools, curbs, roads, swales, and other physical elements shall be located by survey control.
- G. Underground pipelines need not be located using survey control but shall be located using standard survey equipment operated by persons experienced in their operation.

#### 1.06 SURVEY REQUIREMENTS

- A. The Architect/Engineer will provide two (2) benchmarks.
- B. The Contractor shall, with his own forces, obtain working or construction lines or grades as needed subject to the check of the surveyor. The surveyor shall set offsets.
- C. Establish elevations, lines, offsets and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements, stakes for grading, curbs, fill and topsoil placement, utility locations, slopes and invert elevations.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations, and equipment foundations.
- D. Provide tie distances on record drawings to all underground structures, valves, pipes, and utilities installed as work of this Contract.

**END OF SECTION 013223**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section specifies the requirements for making submissions for the project. Electronic submissions will be required unless expressly noted otherwise.
- B. Refer to Section 013216 - Construction Schedule for the requirements concerning the submission of construction schedules and for making updates thereto.

## 1.02 IDENTIFICATION OF SUBMITTALS

- A. Each and every submission shall be provided by the Contractor and shall be accompanied by a SUBMISSION TRANSMITTAL FORM. The Contractor shall use the specimen form made a part of this Section. *Submittals not containing the form will be returned to the Contractor un-reviewed.* The Architect/Engineer will not review project submissions until such time as the form is completed in its entirety. Identify each submittal and resubmittal using the form.
- B. Each individual submittal shall be identified with a 'submission log number' as specified here in this example: 033000.01-1
  - 1. The Section number for which the submittal applies, followed by a period, shall be indicated, "033000."
  - 2. The submittal within the Section shall be indicated by the next grouping "01". For instance and in this example, the concrete design mix may be submission "01", the waterstop catalog cut may be "02", and so on. Submittals shall be sequentially numbered within the Specification Section, i.e. 01, 02, etc.
  - 3. The number of times the submission was made shall be preceded by a dash and a numerical suffix as follows: "-1". In this example, the concrete design mix is being submitted for the first time. Use the number "1" for the first time it is being submitted.
  - 4. Subsequent submissions of the concrete design mix shall utilize the original number and a sequential numeric suffix, i.e. "2" for a resubmission, "3" for the second resubmission, and so on. Substitute the new number for the original "1".
- C. Where a layout drawing, containing different elements of the project, is being submitted and there is a question as to what the log number might be, then the Contractor shall contact the Architect/Engineer so that an agreed upon log number can be assigned.
- D. It is incumbent on the Contractor to initially assign the submission log number designation to each submission. Submissions not containing a log number, as specified above, will be returned to the Contractor un-reviewed by the Architect/Engineer.
- E. Every submittal shall also be accompanied by a Transmittal Letter (or "Speed Form") addressed to the Architect/Engineer's Project Manager as hereinafter defined.

## 1.03 COORDINATION OF SUBMITTALS

- A. Prior to submitting to the Architect/Engineer, fully coordinate all interrelated work. As a minimum, do the following:
  - 1. Determine and verify all field dimensions and conditions by field measuring existing conditions and the installed work of this Contract and work by others.
  - 2. Coordinate with all trades, subcontractors, vendors, system and equipment suppliers and manufacturers, public agencies, and utility companies and secure all necessary approvals, in writing.
- B. Make submittals in groups containing all associated items that in some way depend upon each other.

1. This also applies to color charts, as one color may not be able to be selected without the selection of other colors so as to form a color-coordinated group.
2. The Architect/Engineer may elect not to review partial or incomplete submissions, whereupon he will notify the Contractor of the additional submissions that are required before a review can be made.

#### 1.04 TIMING OF SUBMITTALS

- A. Make submittals far enough in advance of scheduled dates of installation to provide time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery. The Architect/Engineer will review submittals in a manner as expedient as possible, and will generally send a written response to the Contractor within seven (7) calendar days of receipt of submittals.
- B. Submissions may be returned reviewed, unreviewed, rejected, returned conditioned upon submission of related items, or for other reasons set forth in the Contract Documents.
- C. Make submissions well in advance as the returning, rejecting or disapproval of submissions or other similar circumstances are possible and are deemed "avoidable delays". Costs for these delays or those attributed to Contractor's tardiness in making submittals shall be borne by the Contractor.
- D. All submittals requiring Architect/Engineer's review (except operations manuals) as required under the technical specifications of these documents shall be submitted within **FORTY FIVE (45)** consecutive calendar days after the date of the Notice to Proceed. An amount of **\$250** per calendar day shall be deducted from payment due the Contractor for each day that an outstanding submittal exists, said amount being the cost associated with the Architect/Engineer's review.
- E. Operation and maintenance manuals shall be submitted at least **FORTY FIVE (45)** consecutive calendar days prior to scheduled startup of the unit or system.
- F. If material or equipment is installed before it has been deemed to be in general compliance with the Contract Documents, as determined by the Architect/Engineer, the Contractor shall be liable for its removal and replacement at no extra charge and without an increase in contract time.

#### 1.05 DESTINATION OF SUBMITTALS

- A. Each submission of documents shall be accompanied by a transmittal form containing the name of the project, the contract name, the Architect/Engineer's project manager, a submittal ID number, and a description of content for the submitted items.
- B. A copy of the TRANSMITTAL FORM shall also be provided to the Architect/Engineer's resident engineer/inspector at the job site.
- C. Electronic submittals shall be transmitted through the Newforma® Project Center website or by email, pending instruction by the Architect/Engineer. H2M architects + engineers is using a project information application called Newforma® Project Center. One of its components is Newforma Info Exchange, a web application that facilitates sending and sharing transmittals, and file sharing.
- D. As an external team member on this project the Contractor will be required to access the H2M architects + engineers/Newforma Info Exchange website for information related to the project, including file transfers, RFI, Submittals, Action Items, and project Calendar information. The Contractor will have access to this website using any internet-capable computer running Internet Explorer or Firefox. All data transmitted through the H2M architects + engineers/Newforma Info

Exchange website is encrypted and logged. Further instructions will be provided to the Contractor after the contract is awarded.

#### 1.06 CLARITY OF SUBMITTALS

- A. All printed materials shall be neat, clean, professionally drafted by hand or by computer, clear, legible, and of such quality that they can be easily reproduced by normal photocopying or blueprinting machines.
- B. All electronic submittals shall be produced with a minimum resolution of 300 dpi.
- C. Binders of information shall be separated into groups, subsystems, or similar equipment/function. Copies not conforming to this paragraph will be returned to the Contractor without the Architect/Engineer's review.

#### 1.07 CONTRACTOR'S REPRESENTATION

- A. By making a submission, the Contractor represents that he has determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving equipment into an enclosed space, materials, catalog and model numbers and similar data and that he has checked and coordinated each submission with other work at or adjacent to the project site in accordance with the requirements contained in Section 013100 - Project Management and Coordination and the Contract Documents.
- B. Every SUBMISSION TRANSMITTAL FORM shall contain the Contractor's approval stamp and date showing that the submittal has been approved by the Contractor. The Architect/Engineer will not review submittals that have not yet been reviewed and approved by the Contractor.

#### 1.08 ENGINEER/ARCHITECT'S REVIEW

- A. Architect/Engineer will review and comment on each submission conforming to the requirements of this Section.
  - 1. Architect/Engineer's review will be for conformance with the design concept of the project and will be confined to general arrangement and compliance with the Contract Documents only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, laying lengths, tolerances, interference's, for coordinating the work by others or subcontractors.
  - 2. The Architect/Engineer's review of a separate item, or portion of a system, does not represent a review of an assembly or system in which the item functions.
- B. The Architect/Engineer will mark submittals as follows:
  - 1. NO EXCEPTION TAKEN (A) - No corrections, no marks. The content of this submittal has been reviewed by the Architect/Engineer and been found to be in general compliance with the Contract Documents. No further submission of this submittal is required and the information contained in the submittal may be built into the work in accordance with the Contract Documents.
  - 2. MAKE CORRECTIONS NOTED (B) - Minor amount of corrections. The content of this submittal has been reviewed by the Architect/Engineer and has been found in general to be in compliance with the Contract Documents. The notations made on the submittal by the Architect/Engineer shall be incorporated into the work in accordance with the terms and conditions of the Contract Documents. No further submission of this submittal is required.
  - 3. AMEND AND RESUBMIT (C) - The content of this submittal has been reviewed by the Architect/Engineer and this review has determined that additional data and/or modification to the submitted data or other changes are required to bring the work represented in this submittal into compliance with the Contract Documents. This submittal shall be reviewed

and revised in accordance with the Architect/Engineer's comments and resubmitted to the Architect/Engineer for review. The information contained on the resubmittal shall not be incorporated into the work until the submittal is returned to the Contractor marked "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED".

4. REJECTED (D) - The content of this submittal has been reviewed by the Architect/Engineer and has been determined not to be in accordance with the requirements contained in the Contract Document and requires too many corrections or other justifiable reason. The submittal shall be corrected and resubmitted or a submittal of an alternate shall be provided. No items are to be fabricated under this mark.
  5. SUBMIT SPECIFIED ITEM (E) - The content of this submittal has been reviewed by the Architect/Engineer and this review has indicated that the work displayed in the submittal is not in compliance with the Contract Documents. The Contractor shall submit another submittal for this portion of the work, which complies with the Contract Documents.
  6. RECEIVED (R) - This submittal is accepted on the project and filed for record purposes only, in accordance with the terms and conditions of the Contract Documents. Documents marked "RECEIVED" will not be returned.
- C. No payment will be made on any item for which a submission is required if such submission:
1. has not been made,
  2. has been made but was not stamped "No Exceptions Taken" by Architect/Engineer,
  3. has been made and stamped "Make Corrections Noted", but contractor has not complied with Architect/Engineer's notes marked on the submittal,
  4. has been made and stamped "No Exceptions Taken", but item provided does not conform to the shop drawing nor to the Contract Documents.

D. Submittals not required by these specifications will not be recognized or processed.

#### 1.09 RESUBMISSIONS

- A. Prepare new and additional submissions, make required corrections, and resubmit corrected copies until found in compliance with the Contract Documents.
- B. On, or with, re-submittals, clearly describe revisions and changes made, other than the corrections requested by Architect/Engineer, which did not appear on the previous submissions.

#### 1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Architect/Engineer's review of submittals shall not relieve the Contractor of his/her responsibility for any deviation from the requirements of the Contract Documents nor relieve the Contractor from responsibility for errors or omissions in the submittals.
- B. No portion of the work requiring a submission shall be commenced until the Architect/Engineer has found the submission in general compliance with the Contract Documents.
- C. The Contractor shall provide written notification of any specification or drawing deviation.

#### 1.11 EXCESS COSTS FOR ENGINEERING/ARCHITECTURAL SERVICES

- A. The Owner will charge to the Contractor, and will deduct from the partial and final payments due the Contractor, all excess engineering and architectural expenses incurred by the Owner for extra services (work) conducted or undertaken by the Architect/Engineer as stipulated below:
  1. Services and other similar charges because of the Contractor's errors, omissions, or failures to conform to the requirements of the Contract Documents as related to administrative charges associated with non-compliance with the requirements for making project submissions.

2. Services and other similar charges required to examine and evaluate any changes or alternates proposed by the Contractor and which may vary from the Contract Documents.
3. Services and other similar charges as a result of the Contractor's proposed substitution of materials, equipment or products which require a redesign of any portion of the project, as contained in the Contract Documents at the time of bid.
4. Services and other similar charges as a result of the Contractor's proposed substitution of products which require an engineering and/or architectural evaluation, beyond the time stipulated in Section 012500, to determine if the substituted product is equal to that specified.
5. Services and other similar charges as a result of changes by the Contractor to dimensions, weights, sizes, voltages, phase, horsepower, materials of construction, and similar physical or operating characteristics of the product furnished which require redesign of the project in any way.
6. Services and other similar charges for the review of resubmissions of shop drawings that have been marked as "No Exceptions Taken" or "Make Corrections Noted".
7. Services and other similar charges for the review of shop drawings submitted more than two (2) times for the same product or portion of the work.

#### 1.12 MISCELLANEOUS SUBMITTALS

- A. Provide a Submittal Schedule within seven (7) calendar days from the date of the Notice to Proceed. The Submittal Schedule shall list all submittals for the project referenced by draft log number. Provide the estimated date that the submittal will be transmitted to the Architect/Engineer for review.
- B. Within seven (7) calendar days from the date of the Pre-Construction Meeting, submit a Proposed Products List. This list shall be a complete listing of all products proposed for use, with name of manufacturer, service headquarters, trade name and model number of each product. Partial listings will not be accepted.
- C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

#### 1.13 SUBCONTRACTOR LIST

- A. The Contractor shall submit, on AIA Form G705, within THIRTY (30) calendar days after the date of the Notice to Proceed, a list of all subcontractors, including the names of the major subcontractors that were submitted at the time of the bid.

#### 1.14 MATERIAL SAFETY DATA SHEETS (MSDS)

- A. Comply with "Right to Know" requirements of Chapter 551 of Laws of New York, 1980, concerning notification of the use of toxic substances.
- B. Any product or substance used by the Contractor or its subcontractors which is listed in Subpart Z of OSHA Part 1910 Title 29 of the Code of Federal Regulations entitled "Toxic and Hazardous Substances" shall be identified to the Owner/Architect/Engineer by the Contractor's submission of a standard Material Safety Data Sheet (MSDS) in accordance with "Right To Know" requirements.
- C. Products will not be permitted to be kept on site without a MSDS.

#### 1.15 SHOP DRAWINGS

- A. Submit shop drawings for all fabricated work, for all manufactured items and for items specifically required by the specifications.

- B. Subcontractors shall submit shop drawings directly to the Contractor for checking. Thoroughly check subcontractors' shop drawings for measurements, sizes of members, details, materials, and conformance with the Contract Documents.
  - 1. Return submittals which are found to be inaccurate or in error.
  - 2. Do not submit to the Architect/Engineer until all corrections have been made.
- C. Clearly show the relationship of the various parts of the project and where the information provided on the submission depends upon field measurements and existing conditions.
- D. The Contractor shall make all measurements, confirm existing conditions, and include them on the shop drawings before making a submission to the Architect/Engineer.
- E. Submissions for a single item, or group of related items shall be complete.
- F. When submitting manufacturers' catalogs, pamphlets or other data sheets, in lieu of prepared shop drawings, clearly mark the items being submitted for review.
- G. If the shop drawings contain any departures from the contract requirements, specifically describe them in the letter of transmittal.
  - 1. Where such departures require revisions to layouts, structural, architectural, electrical, HVAC or any other changes to the work as shown, Contractor shall, at his own expense, prepare and submit revised drawings accordingly.
  - 2. Make drawings the same size as the Contract Drawings and to the same scale.

#### 1.16 SAMPLES

- A. Where required, or where requested by the Architect/Engineer, submit sample or test specimens of materials to be used or offered for use.
  - 1. Samples shall be representative, in all respects, of the material offered or intended, shall be supplied in such quantities and sizes as may be required for proper examination and tests, and shall be delivered to Architect/Engineer, prepaid, along with identification as to their sources and types of grades.
  - 2. Submit samples well in advance of anticipated use to permit the making of tests or examinations.
- B. Samples will be checked for conformance with the design and for compliance with the Contract Documents.
- C. Work shall be in accordance with the approved sample. The use of materials or equipment for which samples are requested or required to be submitted is not permitted until such time that the Architect/Engineer has completed his review.

#### 1.17 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation. Provide manufacturer's instructions with shop drawings.

#### 1.18 CERTIFICATIONS

- A. Submit certifications of compliance indicated in the Contract Documents.



- B. Certifications shall be complete and exact, they shall be properly authenticated by the written signature, in ink, of an owner, officer or duly authorized representative of the person, firm or organization issuing such certification and they shall guarantee that the materials or equipment are in complete conformance with the requirements of these specifications.

#### 1.19 COLORS AND PATTERNS

- A. Unless the precise color and pattern are specified, whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts for Architect/Engineer's and Owner's review and selection.

#### 1.20 MANUFACTURER'S SERVICE CENTER

- A. The product of a manufacturer who does not maintain an adequate nearby service center and a sufficient stock of spare parts are subject to rejection by Architect/Engineer solely on that basis.
- B. With each submission, submit information on manufacturer's facilities and give complete details of his service policies and capabilities, and a general idea of the stock of spare parts available. Submit this information in the form of a certification. Also include names, addresses and telephone numbers of at least three of the service center's present customers who are in the area of the project.

#### 1.21 TEST RESULTS AND INSTALLATION

- A. Whenever field startup services are specified, the Contractor shall obtain from the manufacturer and submit to the Architect/Engineer Manufacturer Startup Reports (MSR's). The report shall detail the results of the field visit and all special conditions resulting from the startup.
- B. Whenever field or factory tests are required on materials, equipment and systems, such tests shall be performed and the test results submitted to Architect/Engineer in the form of a MSR.
- C. Do not deliver to the project or incorporate into the work any materials or equipment for which Architect/Engineer has not completed his review and found same to be in general conformance with the Contract Documents.
- D. Submit MSR's within thirty (30) calendar days after the date of the startup or factory test.

#### 1.22 SPARE PARTS LIST

- A. Prepare a list of all spare parts specified to be provided in other Sections. Compile the total list for the purposes of reviewing actual spare parts delivered versus spare parts specified to be provided. The list shall reference the Section, model number, and quantity to be provided.

#### 1.23 WAIVER OF CERTAIN SUBMITTAL REQUIREMENTS

- A. Unless otherwise specified, the requirement to submit data and samples for products specified for approval will be waived for products specified by brand name if the specifically named products are furnished for the work. In such cases, the Contractor shall submit two (2) copies of required Product Data directly to the Architect/Engineer's field representative for information and verification during its incorporation into the work. The SUBMISSION TRANSMITTAL FORM shall always be used.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

THIS SPACE LEFT INTENTIONALLY BLANK

CONTRACTOR'S COMPANY NAME  
ADDRESS

**SUBMISSION TRANSMITTAL FORM**  
**CLIENT NAME:** Vails Gate Fire District  
**PROJECT TITLE:** VGFD2001-New Firehouse

**H2M PROJECT NO.:** VGFD2001

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------|
| Product, Item, or System Submitted:                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
| Submission Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Submission Log No.:       |              |
| Specification Section:                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Paragraph Reference:      |              |
| Contract Drawing Reference(s):                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
| Manufacturer's Name:                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
| Manufacturer's Mailing Address:                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
| Manufacturer's Contact Information:                 | <i>Name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (    )<br><i>Tel. no.</i> | <i>Email</i> |
| Supplier's Name:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
| Supplier's Mailing Address:                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |              |
| Supplier's Contact Information:                     | <i>Name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (    )<br><i>Tel. no.</i> | <i>Email</i> |
| This item is a substitution for the specified item: | ____ No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           | ____ Yes     |
| Contractor's Approval Stamp with Signature & Date   | <u>Contractor's Brief Comments or Remarks</u><br>(attach separate letter as needed):                                                                                                                                                                                                                                                                                                                                                                                                                |                           |              |
|                                                     | By making this submission, we represent that we have determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving the item into the enclosed space, materials, catalog and model numbers and similar data and that we have checked and coordinated this submission with other work at or adjacent to the installed location in accordance with the requirements contained in the Contract Documents. |                           |              |

**END OF SECTION 013300**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Codes
- B. Governing agencies
- C. Permits

## 1.02 CODES

- A. Comply with the requirements of the various codes referred to in these Specifications. Such codes shall be the date of the latest revision in effect at the time of receiving bids.
- B. If there is a conflict between local, state, and/or Federal regulatory requirements, seek a consultation with the State Department of Labor. Resolve conflicts to the satisfaction of the State Department of Labor prior to commencing work.
- C. Electrical Work: Conform to the requirements of the National Electrical Code (NEC) unless otherwise shown or specified. The Owner will be the sole judge of the interpretation of these rules and requirements.
- D. Elevator Work; conform to:
  - 1. American National Standard Safety Code for Elevators, Dumbwaiters, and Escalators as approved by American Standards Association, referred to herein as ANSI Code.
  - 2. Industrial Code Bulletin No. 8 as adopted by the State Industrial Board, State of New York, Department of Labor, Board of Standards and Appeals. Submission of plans and specifications, and request for elevator tests to the Department of Labor and the issuance of a certificate of approval from the Department of Labor will not be required.
  - 3. In event of conflict between American National Safety Code and New York State Code Bulletin 8, the more rigid requirements shall apply as interpreted by the State.

## 1.03 GOVERNING AGENCIES

- A. All work shall conform to and be performed in strict accordance with all governing agencies such as, but not limited to:
  - 1. Occupational Safety and Health Act - OSHA
  - 2. State Department of Environmental Conservation
  - 3. State Building Code
  - 4. State Fire Code
  - 5. National Fire Protection Association - NFPA
  - 6. National Electrical Code
  - 7. State Plumbing Code
  - 8. New York State Energy Conservation Construction Code
  - 9. County Department of Health
  - 10. Town Codes, Rules, Laws and Ordinances
  - 11. Sewer District Sewer Use Code
  - 12. Local Water District
  - 13. Electric Utility
  - 14. Gas Utility
  - 15. State Education Department

## 1.04 PERMITS AND INSPECTIONS

- A. Representatives of the Owner shall have access to the work for inspection purposes. The Contractor shall provide facilities suitable to the Owner to facilitate inspections of the installed work.
- B. Obtain and pay for all permits, fees, licenses, certificates, inspections and other use charges required in connection with the work.
- C. Comply with provisions and actions included in the Stormwater Pollution Prevention Plan (SWPPP) that has been prepared by the Architect/Engineer for the project, in regard to erosion and sediment control and pollution prevention of surface waters. The SWPPP is available for review at the Architect/Engineer's office.
- D. Obtain a New York Board of Fire Underwriters inspection and certificate.
- E. The following permits and/or certifications will be obtained by the Owner from the appropriate permitting agencies:
  - 1. Building Permit

## 1.05 NOISE CONTROL

- A. Control noise in accordance with Town and OSHA requirements.
- B. Operations which may generate objectionable noise shall be limited to between the hours of 8:00 a.m. to 4:30 p.m. on weekdays.

## 1.06 PERFORMANCE BONDS

- A. The Contractor shall obtain, pay for and submit all bonds required in connection with the work.

## 1.07 LISTINGS

- A. Equipment and materials for which Underwriters' Laboratories, Inc. (UL) provides product listing service, shall be listed and bear the listing mark. Alternately, ETL Testing Laboratories, Inc. Product Safety Testing Listing is acceptable if the listed product has been tested to the applicable UL Standard.

## 1.08 FIRE RESISTANT CONSTRUCTION MATERIALS AND ASSEMBLIES

- A. Conform to the fire rating classifications based upon the test methods and acceptance criteria in the Standard, Fire Tests of Building Construction and Materials for which Underwriters' Laboratories, Inc. (UL) provides listings.
- B. Materials and assemblies shall comply with the acceptance criteria, detailed description of the assembly, its performance in the fire test and other pertinent details such as specification of materials, Classification coverage, and alternate assembly details.
- C. Alternatively, fire resistance rating classifications by other issuing organizations listed in the Fire and Building Codes are acceptable.

## 1.09 COORDINATION WITH ELECTRIC UTILITY COMPANY

- A. Comply with the utility company requirements for the incoming electric service.

1. Pay the utility company's charges in connection with the installation of the incoming service.
- B. Comply with the utility company requirements for the incoming electric service. There are no utility company charges associated with the installation of the incoming service.

#### 1.10 COORDINATION WITH GAS UTILITY COMPANY

- A. Comply with the gas utility company requirements including inspection for the incoming gas service.
  1. Pay the utility company's charges in connection with the installation and inspection of the incoming service.

#### 1.11 COORDINATION WITH WATER UTILITY

- A. Comply with the water utility requirements for water and fire service connections. Obtain and pay for all necessary permits from the water utility. Obtain authority to connect to the existing water mains.
  1. Make necessary connections to existing public water mains under supervision of the water utility representative.

#### 1.12 COORDINATION WITH SANITARY SEWER UTILITY

- A. Comply with the public utility requirements for the connection of sanitary sewer lines to the public utility services. Obtain and pay for all necessary permits from public sewer department. Obtain authority to connect to their existing sanitary sewers.

### PART 2 - PRODUCTS

NOT USED

### PART 3 - EXECUTION

NOT USED

**END OF SECTION 014100**

## PART 1 - GENERAL

## 1.01 ABBREVIATED SUMMARY

- A. This Section explains the format of the specifications.

## 1.02 SPECIFICATION FORMAT

- A. The Specifications are generally arranged according to the Construction Specifications Institute (CSI) format. Most of the technical requirements are specified in the technical specifications of the document, which are grouped into forty-eight (48) major divisions. Most of the legal and administrative requirements are included in Division 01, General Conditions, Information For Bidders, and the Contract (agreement).
- B. Technical sections are arranged in numerical order, however section numbers may not be consecutive from section to section.
- C. Page numbering is subordinate to each section.
- D. Most sections are generally broken down into three (3) parts:
1. PART 1 - GENERAL
  2. PART 2 - PRODUCTS
  3. PART 3 - EXECUTION
- E. Not all these parts may be used and in some cases, the title of some of the parts may be different than listed above. Paragraph numbers are subordinate to each part.
- F. The Contractor is advised that the format described here is flexible in nature.
1. There is some overlapping of specified information between various portions of the Specifications.
  2. In all cases, the entire requirements of the Contract Documents for the project shall apply.
- G. Explanations:
1. Many technical sections begin with a paragraph titled "SECTION INCLUDES", "DESCRIPTION", or similar wording.
    - a. In these paragraphs, a brief listing of the specified products may appear or a brief description of the work generally specified in that section is presented.
    - b. These descriptions or listings are not all inclusive, but merely are provided as an aid in locating subject matter.
    - c. In some cases special cost related items of work are called to the attention of the Contractor in these opening paragraphs.
  2. "RELATED SECTIONS" or "RELATED WORK" or similar wording paragraphs list or reference related work specified elsewhere in the Contract Documents. Such listing is not all inclusive, rather, they are merely an aid to the Contractor in locating some of the other Specification Sections wherein work is specified which has a particularly close interrelationship with the work specified in that section.

- a. It shall be understood that all of the Work, and all of the Specifications and other portions of the Contract Documents, are interrelated, and that the total of all requirements set forth in all of the Contract Documents shall be met.
  - b. Equipment suppliers and manufacturers shall be advised of the requirements for making submittals and delivering products, as specified in Division 1 sections, even if said sections are not referenced therein that section.
3. "REGULATORY REQUIREMENTS" or "REFERENCES" or similar wording paragraphs describe standards, laws, guidelines, regulations, and standards related to workmanship and installation of the products specified which shall be followed by the Contractor in completing the work specified therein that section as if it was written there in that section. All such requirements and references shall be latest issue in effect at the time of the bid opening.
4. When a "GUARANTEE" or "WARRANTY" paragraph appears in the section it is calling attention to a guarantee which extends beyond the period of the Contractor's Guarantee called for in the administrative portion of the Contract Documents or it states special requirements specific to the equipment, systems or products specified in that section.

**PART 2 - PRODUCTS**

NOT USED

**PART 3 - EXECUTION**

NOT USED

**END OF SECTION 014223**



PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for pre-installation meetings.

1.02 PRE-INSTALLATION MEETINGS

- A. As required in individual specification sections, the Contractor shall convene a pre-installation meeting at the site prior to commencing work of the section.
- B. Pre-installation meetings are to be convened at least one week prior to commencing work on the section. The contractor shall arrange and require attendance of Owner/Architect/Engineer and parties directly affecting, or affected by, work of the specific section.
  - 1. At least seven (7) calendar days advance notice is to be given.
  - 2. The contractor shall prepare agenda and preside at meeting. At a minimum the following items are to be discussed:
  - 3. Review conditions of installation, preparation and installation procedures.
  - 4. Review coordination with related work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**END OF SECTION 014320**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Requirements for monitoring the quality of the constructed project.
- B. Work of this Section also includes services of an independent testing laboratory for quality assurance testing.
- C. The services of the testing laboratory will be paid for out of the cash allowance included by the Contractor in the price as bid in accordance with the requirements contained herein and in Section 012100 - Allowances.

## 1.02 REFERENCES

- A. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- C. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
- D. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

## 1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or workmanship that is more precise.
- C. Perform work by persons qualified to produce workmanship of specified quality.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
- E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

## 1.04 MOCK-UP

- A. Tests will be performed under provisions identified in this Section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashing, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining work.

- D. Where a mock-up has been accepted by the Architect/Engineer and is specified to be removed, then the Contractor shall remove the mock-up and the clear area when directed to do so by the Architect/Engineer.

#### 1.05 QUALITY ASSURANCE - TESTING LABORATORY

- A. In order to establish compliance with the Contract Documents, materials shall be tested, examined and evaluated before they are incorporated into the work. During and after installations, additional tests, examinations, and evaluations shall be made to determine continued compliance throughout the course of the work.
- B. Testing laboratory shall be a reputable, experienced firm that is capable of performing all of the required testing and authorized to operate in the state in which the project is located.
- C. Perform all sampling and testing in accordance with specified procedures and use the materials, instruments, apparatus, and equipment required by the codes, regulations and standards. Where specific testing requirements or procedures are not described, perform the testing in accordance with all pertinent codes and regulations and with recognized standards for testing.
- D. In the event that samples and test specimens are not properly taken, handled, stored or delivered or if other requirements of this Section are not complied with, Architect/Engineer reserves the right to delegate any or all of this work to others, or to take whatever action deemed necessary to ensure that sampling and testing are properly accomplished, for which all costs shall be borne by Contractor.
- E. Architect/Engineer reserves the right to disapprove the use of a specific testing laboratory, even after prior approval, if the laboratory fails to meet or comply with the requirements of this Section. If this should occur, immediately discharge the testing laboratory and retain the services of a different laboratory acceptable to Architect/Engineer.
- F. The testing laboratory shall meet the following criteria:
  - 1. Be capable of performing all of the required tests.
  - 2. Be regularly engaged in performing the types of services required.
  - 3. Have adequate facilities, materials, equipment, and personnel to perform the services.
  - 4. Have an adequately trained, experienced and qualified staff.
  - 5. Have at least one registered professional engineer licensed in the state in which the project is located who shall be capable of performing field tests, supervising laboratory testing and interpreting test results. The professional engineer shall be thoroughly knowledgeable in materials, soils, asphalt paving and concrete.
  - 6. Shall be able to be on the Project site within two hours after being notified.
  - 7. Comply with the requirements of ASTM C1077, ASTM D3740, ASTM D4561, ASTM E548 and ASTM E699.
  - 8. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

#### 1.06 REFERENCE STANDARDS

- A. Conform to reference standards by date that the project was last bid.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.07 SUBMITTALS

- A. Within fifteen (15) calendar days from the date of the Notice to Proceed, submit documentation from three (3) testing laboratories that clearly indicates experience, location, qualifications of staff, and descriptions of any limitations or restrictions of the firm.
  - 1. Include a price schedule for standard tests and a billing rate schedule for technician classifications.
  - 2. Based upon this information, the Architect/Engineer will select one firm to be the primary testing laboratory and one firm to act as a standby.
- B. Certified copies of each test report shall be mailed directly to the Architect/Engineer. The Contractor shall arrange with the laboratory to secure copies.
- C. Each report shall be in writing and shall include the testing method used, the test results, the specified results, the exact location of where the test specimens were taken, the date taken, Project identification, Contractor's name and other pertinent information required for a complete and meaningful test report.
- D. Each report shall be signed and certified by a responsible officer of the testing laboratory.

#### 1.08 SCHEDULING - LABORATORY SERVICES

- A. Except where otherwise specified, the Architect/Engineer will determine the number of samples to be taken, the date and time samples will be taken and tests made, the number and type of tests to be performed, who will collect the samples, how they will be handled and stored and when laboratory personnel are required on site.
- B. Architect/Engineer will notify Contractor of his/her decision to take samples and/or have tests made and provide him with the pertinent information. Contractor is responsible for notifying the testing laboratory and for having the testing performed, on schedule.
- C. In addition to the above, Contractor shall make his own arrangements for the sampling and testing of materials he proposes to incorporate into the work. This shall not be paid for out of the cash allowance.
- D. Notify Architect/Engineer at least 72 hours in advance of the times at which scheduled samples or tests will be conducted.
- E. If samples and/or tests cannot be taken or performed when required, delay the work until such time that they can be accomplished. Where possible, any work that has been installed but has not been sampled or tested as required, shall be tested by other means. Upon Architect/Engineer's request, uncover any work, which has been buried or covered, and perform special tests designated by Architect/Engineer. If the work cannot be tested by other means, Architect/Engineer may declare the work unacceptable. All costs associated with noncompliance and for special testing shall be borne by the Contractor and not be paid for out of the cash allowance.
- F. Should the testing laboratory be scheduled to take or collect samples or to perform tests, and finds that it is unable to do so as a result of delays in construction, inclement weather, or any other reason, reschedule the tasks for a date acceptable to Architect/Engineer. Costs associated with times testing laboratory is unable to perform scheduled services shall be borne by the Contractor and will not be paid for under the allowance.

- G. Plan all work and operations to allow for the taking and collection of samples and allow adequate time for the performance of tests. Delay the progress of questionable work until the receipt of the certified test reports.

#### 1.09 TESTING REQUIREMENTS

A. Compaction Testing - Soil:

1. Perform compaction testing in accordance with ASTM D2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) or ASTM D1556 Density and Unit Weight of Soil In Place by the Sand Cone Method.
2. Perform tests and analysis of fill material in accordance with ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-inch Drop.

B. Compaction Testing - Asphaltic Concrete Pavement:

1. Perform asphaltic concrete compaction testing in accordance with ASTM D2950 - Standard Test Method of Density of Bituminous Concrete in Place by Nuclear Methods.
2. Calibrate nuclear density measurement equipment based on theoretical maximum specific gravity of asphaltic concrete pavement material.
3. Perform test to determine theoretical maximum specific gravity in accordance with ASTM D2041 Theoretical Maximum Specific Gravity of Bituminous Pavement Mixtures. Perform test on mix at plant prior to delivery. Collect sample at plant in accordance with ASTM D979 - Sampling Bituminous Paving Mixtures and perform test in approved laboratory if plant does not have necessary equipment.

C. Concrete Testing:

1. Collect samples in accordance with ASTM C172, Practice for Sampling Freshly Mixed Concrete.
2. Make test cylinders in accordance with ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
3. Test concrete cylinders in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. Test slump and air entrainment.

#### 1.10 TESTING SCHEDULE

A. Compaction Testing of Soil:

1. Pipe Installation: As directed by the Architect/Engineer.
2. Concrete flatwork: As directed by the Architect/Engineer.
3. Pavement subgrade: As directed by the Architect/Engineer.

B. Concrete Testing: Make six (6) concrete test cylinders for each 50 c.y. or fraction thereof.

1. Test two (2) cylinders at 7 days.
2. Test two (2) cylinders at 28 days.
3. The remaining cylinders shall be tested at a time to be determined by the Architect/Engineer. This requirement shall be subject to change as required by the Architect/Engineer.

C. Asphalt Testing: As directed by the Architect/Engineer.

#### 1.11 FIELD OBSERVATION OF CONTRACTOR'S WORK

- A. The Architect/Engineer will provide periodic observation of the Contractor's work.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions. Verify that the existing substrate is capable of structural support or attachment of new Work being applied or attached. Examine and verify specific conditions described in individual specification sections. Verify that utility services are available, of the correct characteristics, and in the correct locations.

## 3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance. Seal cracks or openings of substrate prior to applying next material or substance.
- B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

## 3.03 FIELD QUALITY CONTROL

- A. Allow representatives of the testing laboratory access to the work at all time. Provide all equipment, labor, materials, and facilities required by the laboratory to properly perform its functions. Cooperate with and assist laboratory personnel during the performance of their work.
- B. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by Architect/Engineer. Conduct field sampling and testing in the presence of Architect/Engineer. Provide all materials, equipment, facilities and labor for securing samples and test specimens and for performing all field-testing.

**END OF SECTION 014500**

|                                                                                                                                                                                                                                                                                                                        |  |                                                                                                              |                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------|--------------------|
| <b>CLIENT: Vails Gate Fire District</b><br><b>PROJECT: New Storage Building</b><br><b>ADDRESS: 872 Blooming Grove Turnpike, New Windsor, NY 12553</b>                                                                                                                                                                  |  | <b>STATEMENT OF SPECIAL INSPECTIONS AND TESTS</b><br>As required by the 2020 Building Code of New York State |                    |
| BC NYS § 1704.3 requires the project Design Professional to complete the Statement of Special Inspections and Tests. Completion of the Statement of Special Inspections & Tests and submission to the Building Department with the Construction Permit Application is a condition for issuance of the Building Permit. |  |                                                                                                              |                    |
| Owner<br>Vails Gate Fire District                                                                                                                                                                                                                                                                                      |  | Building<br>New Storage Building                                                                             |                    |
| Project Title<br>VGFD2001-New Firehouse                                                                                                                                                                                                                                                                                |  |                                                                                                              |                    |
| Project #<br>VGFD2001                                                                                                                                                                                                                                                                                                  |  | Project Address<br>872 Blooming Grove Turnpike, New Windsor, New York, 12553                                 |                    |
| Architect/Engineer<br>H2M architects + engineers                                                                                                                                                                                                                                                                       |  |                                                                                                              |                    |
| Name of Person Completing this Statement<br>Katia Duque                                                                                                                                                                                                                                                                |  | Phone<br>(631)756-8000                                                                                       | Date<br>11/15/2021 |
| Comments                                                                                                                                                                                                                                                                                                               |  |                                                                                                              |                    |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)             | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD                               | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>E<br>Q<br>C<br>U<br>K<br>I<br>R<br>I<br>E<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|-------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>A. Steel Construction</b>                                                              |                                                |                                      |                                                     | 1705.2                                                             |                                                                    |                                                                                |
| 1. Structural Steel.                                                                      | X                                              | X                                    | AISC 360<br>Chapter N.5                             | 1705.2<br>1705.2.1                                                 | X                                                                  | 051200                                                                         |
| 2. Cold Formed steel deck.                                                                |                                                | X                                    | SDI QA/QC<br>2011                                   | 1705.2<br>1705.2.2                                                 | X                                                                  | 053100                                                                         |
| 3. Installation of open-web<br>steel joist and joist girders.                             |                                                | X                                    | SJI<br>specification<br>(Section<br>2207.1)         | 1705.2<br>1705.2.3<br>1705.2.4                                     | X                                                                  | 052100                                                                         |
| <b>B. Concrete Construction</b>                                                           |                                                |                                      |                                                     | 1705.3<br>Table<br>1705.3                                          |                                                                    |                                                                                |
| 1. Inspection of reinforcing<br>steel, including prestressing<br>tendons, and placement.  |                                                | X                                    | ACI 318: Ch.<br>20, 25.2,<br>25.3,<br>26.6.1-26.6.3 | 1705.3<br>1908.4                                                   | X                                                                  | 033000                                                                         |
| 2a. Reinforcing Bar welding -<br>Weldability of reinforcing<br>bars other than ASTM A706. |                                                | X                                    | AWS D1.4;<br>ACI 318:<br>26.6.4                     | 1705.3.1Ta<br>ble 1705.3                                           | X                                                                  | 033000                                                                         |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)                                                         | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD                              | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>E<br>Q<br>U<br>I<br>R<br>I<br>E<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|----------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------|
| 2b. Reinforcing bar welding-Single-pass fillet welds, maximum 5/16 inches.                                                            |                                                | X                                    | AWS D1.4;<br>ACI 318:<br>26.6.4                    | 1705.3.1Ta<br>ble 1705.3                                           | X                                                        | 033000                                                                         |
| 2c. Reinforcing bar welding - All other welds.                                                                                        | X                                              |                                      | AWS D1.4;<br>ACI 318:<br>26.6.4                    | 1705.3.1<br>Table<br>1705.3                                        | X                                                        | 033000                                                                         |
| 3. Cast in concrete anchorage                                                                                                         |                                                | X                                    | ACI 318:<br>17.8.2                                 | Table<br>1705.3                                                    | X                                                        | 033000                                                                         |
| 4a. Post installed concrete members - Adhesive anchors installed horizontally or upwardly inclined to resist sustained tension loads. | X                                              |                                      | ACI, 318:<br>17.8.2.4                              | Table<br>1705.3                                                    | X                                                        | 033000                                                                         |
| 4b. Post installed concrete members - Mechanical anchors and adhesive anchors not defined in 4a.                                      |                                                | X                                    | ACI, 318:<br>17.8.2                                | Table<br>1705.3                                                    |                                                          |                                                                                |
| 5. Verify use of design mix.                                                                                                          |                                                | X                                    | ACI 318: Ch.<br>19, 26.4.3,<br>26.4.4              | Table<br>1705.3,<br>1904.1,190<br>4.2, 1908.2,<br>1908.3           | X                                                        | 033000                                                                         |
| 6. Sampling fresh concrete, slump, air content, temperature, strength test specimens.                                                 | X                                              |                                      | ASTM C172,<br>ASTM C31;<br>ACI 318:<br>26.4, 26.12 | Table<br>1705.3,<br>1908.10                                        | X                                                        | 033000                                                                         |
| 7. Inspect concrete and shotcrete placement for proper application techniques.                                                        | X                                              |                                      | ACI 318: 26.5                                      | Table<br>1705.3<br>1908.6<br>1908.7<br>1908.8                      |                                                          |                                                                                |
| 8. Inspection for maintenance of specified curing temperature and techniques.                                                         |                                                | X                                    | ACI 318:<br>26.5.3-26.5.6                          | Table<br>1705.3,<br>1908.9                                         | X                                                        | 033000                                                                         |
| 9. Inspection of prestressed concrete.                                                                                                | X                                              |                                      | ACI 318:<br>26.10.                                 | Table<br>1705.3                                                    |                                                          |                                                                                |
| 10. Erection of precast concrete members.                                                                                             |                                                | X                                    | ACI 318: Ch.<br>26.9                               | Table<br>1705.3                                                    |                                                          |                                                                                |



| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)                                                                                         | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD                                                            | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>Q<br>C<br>U<br>K<br>I<br>R<br>I<br>E<br>F<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 11. Verification of in-situ concrete strength prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and slabs. |                                                | X                                    | ACI 318:<br>26.11.2                                                              | Table<br>1705.3                                                    |                                                                    |                                                                                |
| 12. Inspect formwork for shape, location and dimensions of the concrete member being formed.                                                                          |                                                | X                                    | ACI 318:<br>26.11.1.2(b)                                                         |                                                                    | X                                                                  | 033000                                                                         |
| 13. Material Tests - In absence of sufficient data or documentation for materials.                                                                                    |                                                | X                                    | ACI 318<br>Ch.19 and<br>20.                                                      |                                                                    |                                                                    |                                                                                |
| <b>C. Masonry Construction</b>                                                                                                                                        |                                                |                                      |                                                                                  |                                                                    |                                                                    |                                                                                |
| 1. Masonry construction                                                                                                                                               | X                                              | X                                    | ACI 530<br>/ASCE 5/<br>TMS 402 and<br>ACI 530.1 /<br>ASCE 6 /<br>TMS 602<br>Ch.3 | 1705.4                                                             | X                                                                  | 042200                                                                         |
| 2. Empirically designed masonry, glass unit masonry and masonry veneer in Risk Category IV.                                                                           |                                                | X                                    | TMS 402 /<br>ACI 530 /<br>ASCE 5<br>Level B Ch. 3                                | 1705.4.1<br>2109<br>2110 or<br>Ch. 14                              |                                                                    |                                                                                |
| 3. Vertical masonry foundation elements                                                                                                                               | X                                              | X                                    |                                                                                  | 1705.4<br>1705.4.2                                                 |                                                                    |                                                                                |
| <b>D. Wood Construction</b>                                                                                                                                           |                                                |                                      |                                                                                  | 1705.5                                                             |                                                                    |                                                                                |
| 1. Wood construction - Fabrication of wood structural elements and assemblies.                                                                                        |                                                | X                                    |                                                                                  | 1705.5,<br>1704.2.5                                                |                                                                    |                                                                                |
| 2. High-load Diaphragms.                                                                                                                                              |                                                | X                                    |                                                                                  | 1705.5<br>1705.5.1<br>2306.2<br>1704.2                             |                                                                    |                                                                                |
| 3. Metal-plate-connected wood trusses spanning 60 feet or greater (temp. and permanent installations)                                                                 |                                                | X                                    |                                                                                  | 1705.5.2                                                           |                                                                    |                                                                                |
| <b>E. Soils</b>                                                                                                                                                       |                                                |                                      |                                                                                  | 1705.6                                                             |                                                                    |                                                                                |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS) | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>Q<br>C<br>U<br>K<br>I<br>R<br>I<br>E<br>F<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|-------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|-----------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1. Subgrade inspection                                                        |                                                | X                                    |                       | 1705.6<br>Table<br>1705.6                                          | X                                                                  | 312323                                                                         |
| 2. Classification and testing of compacted fill materials                     |                                                | X                                    |                       | 1705.6                                                             | X                                                                  | 312323                                                                         |
| 3. Evaluation of in-place density and lift thickness.                         | X                                              |                                      |                       | 1705.6                                                             | X                                                                  | 312323                                                                         |
| <b>F. Driven Deep Foundations</b>                                             |                                                |                                      |                       | 1705.7                                                             |                                                                    |                                                                                |
| 1. Installation and load tests (if applicable)                                | X                                              |                                      |                       | 1705.7<br>Table<br>1705.7                                          |                                                                    |                                                                                |
| <b>G. Cast-In-Place Deep Foundations</b>                                      |                                                |                                      |                       | 1705.8                                                             |                                                                    |                                                                                |
| 1. Installation, end bearing strata, and load tests (if applicable)           | X                                              |                                      |                       | 1705.8<br>Table<br>1705.8                                          |                                                                    |                                                                                |
| <b>H. Helical Pile Foundations</b>                                            |                                                |                                      |                       | 1705.9                                                             |                                                                    |                                                                                |
| 1. Installation and load tests (if applicable)                                |                                                |                                      |                       | 1705.9                                                             |                                                                    |                                                                                |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)                                                                       | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>Q<br>C<br>U<br>K<br>I<br>R<br>I<br>E<br>F<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|-----------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>I. Fabricated Items</b>                                                                                                                          |                                                | X                                    |                       | 1705.10<br>1704.2.5                                                |                                                                    |                                                                                |
| <b>J. Wind Resistance</b>                                                                                                                           |                                                |                                      |                       | 1705.11                                                            |                                                                    |                                                                                |
| 1. Applicable in Exposure Category B with a basic wind speed of 120 mph and Exposure Categories C or D with basic wind speed of 110 mph or greater. |                                                |                                      |                       | 1705.11                                                            |                                                                    |                                                                                |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)                                                                                                | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>Q<br>C<br>U<br>K<br>I<br>R<br>I<br>E<br>F<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|-----------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1a. Structural wood - Field gluing operation of elements of main wind force-resisting system (MWRS).                                                                         | X                                              |                                      |                       | 1705.11.1                                                          |                                                                    |                                                                                |
| 1b. Structural wood - Nailing, bolting, anchoring, and fastening elements of the MWRS.                                                                                       |                                                | X                                    |                       | 1705.11.1                                                          |                                                                    |                                                                                |
| 2a. Cold formed steel - Welding operations of elements of MWRS.                                                                                                              |                                                | X                                    |                       | 1705.11.2                                                          |                                                                    |                                                                                |
| 2b. Cold formed steel - Screw attachments, bolting, anchoring, and fastening of elements of MWRS.                                                                            |                                                | X                                    |                       | 1705.11.2                                                          |                                                                    |                                                                                |
| 3. Wind-resisting components - Roof covering, roof deck, and roof framing connections. Exterior wall covering and wall connections to roof and floor diaphragms and framing. |                                                | X                                    |                       | 1705.11<br>1705.11.3                                               |                                                                    |                                                                                |
| <b>K. Special Inspections for Seismic Resistance:</b><br>Applicable to specific structures, systems, and components.                                                         |                                                |                                      |                       | 1705.12                                                            |                                                                    |                                                                                |
| 1. Structural steel - Seismic force-resisting systems & elements.                                                                                                            | X                                              |                                      | AISC 341<br>Chapter J | 1705.12.1.1<br>or<br>1705.12.1.2                                   |                                                                    |                                                                                |
| 2a. Structural wood - Field gluing operation of elements of seismic force-resisting system (SFRS).                                                                           | X                                              |                                      |                       | 1705.12.2                                                          |                                                                    |                                                                                |
| 2b. Structural wood - Nailing, bolting, anchoring, and fastening of elements of SFRS.                                                                                        |                                                | X                                    |                       | 1705.12.2                                                          |                                                                    |                                                                                |
| 3. Cold-formed steel framing - welding and fasteners.                                                                                                                        |                                                | X                                    |                       | 1705.12.3                                                          |                                                                    |                                                                                |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)                                         | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD       | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>Q<br>U<br>I<br>R<br>E<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|-----------------------------|--------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------|
| 4. Designated seismic systems - verify that label, anchorage, and mounting conforms to the certificate of compliance. |                                                | X                                    | ASCE 7<br>Section<br>13.2.2 | 1705.12.4                                                          |                                                |                                                                                |
| 5. Architectural components.                                                                                          |                                                | X                                    |                             | 1705.12.5                                                          |                                                |                                                                                |
| 6. Plumbing, Mechanical and Electrical components.                                                                    |                                                | X                                    |                             | 1705.12.6                                                          |                                                |                                                                                |
| 7. Storage racks and access floors                                                                                    |                                                | X                                    |                             | 1705.12.7                                                          |                                                |                                                                                |
| 8. Seismic isolation systems.                                                                                         |                                                | X                                    |                             | 1705.12.8                                                          |                                                |                                                                                |
| 9. Cold-formed steel special bolted moment frames.                                                                    |                                                | X                                    |                             | 1705.12.9                                                          |                                                |                                                                                |
| <b>L. Structural Testing for Seismic Resistance:</b><br>Applicable to specific structures, systems, and components.   |                                                |                                      |                             | 1705.13                                                            |                                                |                                                                                |
| 1. Structural steel.                                                                                                  | X                                              | X                                    | AISC 341<br>Chapter J       | 1705.13.1                                                          |                                                |                                                                                |
| 2. Nonstructural components.                                                                                          |                                                | X                                    | ASCE 7<br>Section<br>13.2.1 | 1705.13.2                                                          |                                                |                                                                                |
| 3. Designated seismic systems.                                                                                        |                                                | X                                    | ASCE 7<br>Section<br>13.2.2 | 1795.13.3                                                          |                                                |                                                                                |
| 4. Seismic isolation systems                                                                                          |                                                | X                                    | ASCE 7<br>Section 17.8      | 1705.13.4                                                          |                                                |                                                                                |
| <b>M. Sprayed Fire-Resistant Materials [BF]</b>                                                                       |                                                |                                      |                             | 1705.14                                                            |                                                |                                                                                |
| 1. Physical and visual tests.<br>Applicable to specific structures.                                                   |                                                | X                                    |                             | 1705.14.1                                                          | X                                              |                                                                                |
| 2. Structural member surface conditions                                                                               |                                                | X                                    |                             | 1705.14.2                                                          | X                                              |                                                                                |
| 3. Application.                                                                                                       |                                                | X                                    |                             | 1705.14.3                                                          | X                                              |                                                                                |
| 4. Thickness.                                                                                                         |                                                | X                                    | ASTM E 605                  | 1705.14.4                                                          | X                                              |                                                                                |
| 5. Density.                                                                                                           |                                                | X                                    | ASTM E 605                  | 1705.14.5                                                          | X                                              |                                                                                |
| 6. Bond strength.                                                                                                     |                                                | X                                    | ASTM E 736                  | 1705.14.6                                                          | X                                              |                                                                                |
| <b>N. Mastic and Intumescent Fire-Resistant Coatings [BF].</b>                                                        |                                                | X                                    | AWCI 12-B                   | 1705.15                                                            |                                                |                                                                                |

| INSPECTION AND TESTING<br>(Continuous & Periodic is as Defined by the BC NYS)                                                 | C<br>O<br>N<br>T<br>I<br>N<br>U<br>O<br>U<br>S | P<br>E<br>R<br>I<br>O<br>D<br>I<br>C | REFERENCE<br>STANDARD      | B<br>R<br>C<br>E<br>F<br>N<br>E<br>Y<br>R<br>S<br>E<br>N<br>C<br>E | C<br>R<br>H<br>E<br>Q<br>C<br>U<br>K<br>I<br>R<br>I<br>E<br>F<br>D | IDENTIFY SPEC<br>SECTION AND<br>PROVIDE<br>CLARIFYING<br>NOTES IF<br>NECESSARY |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|----------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>O. Exterior Insulation and Finish Systems (EIFS).</b>                                                                      |                                                | X                                    | ASTM E 2570                | 1705.16                                                            |                                                                    |                                                                                |
| <b>P. Fire-Resistant Penetrations and Joints [BF]</b><br>High rise building or buildings assigned to Risk Category III or IV. |                                                | X                                    | ASTM E 2174<br>ASTM E 2393 | 1705.17                                                            | X                                                                  |                                                                                |
| <b>Q. Testing for Smoking Control [F]</b>                                                                                     |                                                | X                                    |                            | 1705.8                                                             |                                                                    |                                                                                |

END OF SECTION 014500.11

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Asbestos and lead-based paint certification.
- B. Moisture control.

## 1.02 ASBESTOS AND LEAD-BASED PAINT CERTIFICATION

- A. Contractor shall submit the enclosed "Asbestos and Lead-Based Paint Certification" upon completion of all work.

## 1.03 MOISTURE CONTROL

- A. The Contractor shall maintain a strict policy and protocol for the control of water infiltration and moisture build-up during the course of the project. The plans and specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the Contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The Contractor has the sole responsibility for ensuring the watertight integrity of the structure. The Contractor's contractual obligations include, but are not limited, to the following:
- B. Water Infiltration: If the Contractor observes water infiltration (unintended) into a completed building or an ongoing construction site, he must immediately report the condition to the Owner and Architect/Engineer, and shall immediately take steps to investigate the source of the water infiltration, identify the responsible party (person who performed work that resulted in water infiltration) and devise a procedure to promptly eliminate water infiltration into the building.
- C. Handling of Water-Damaged Building Materials and Construction:
  - 1. Contractor shall inspect all building materials delivered to the site for pre-existing water damage, as well as existing mold growth.
  - 2. If in-place construction becomes wet, notify the Owner and Architect/Engineer immediately. The Owner and Architect/Engineer will determine whether or not the work shall be removed and replaced, or if the type of material can be permitted to dry.
  - 3. Under no circumstances may new or additional construction be placed over, or otherwise enclose, wet building materials.
- D. Visible Mold/Mildew:
  - 1. If the Contractor observes any substance that appears to be mold or other fungal growth and/or an unidentified substance within a completed building or the ongoing construction site, he shall immediately suspend construction operations in the area, and report the condition to the Owner and Architect/Engineer.
  - 2. No person shall be allowed back into the affected area without permission of the Owner.

## 1.04 SUBMITTALS

- A. Contractor shall submit completed and notarized "Certification of Asbestos and Lead-Based Paint" form.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**This space left intentionally blank.**

**Certificate of Asbestos and Lead-Based Paint  
(New Work)**

Client's Name: \_\_\_\_\_

Project Location: \_\_\_\_\_

Project Address: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project Number: \_\_\_\_\_

**CERTIFICATION:**

This Contractor hereby certifies that no asbestos-containing material and lead-based paint, as defined by applicable federal and state regulations, has been furnished or installed at the referenced project:

Contractor Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Telephone: \_\_\_\_\_ Date Executed: \_\_\_\_\_

**This Form Shall Be Notarized**

**END OF SECTION 014536**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section supplements the General Conditions.
- B. The Work of this Section includes temporary facilities, utilities, and controls to be furnished by the Contractor for this project as it is specified herein.
- C. This Section is made a part of all Construction Contracts associated with the project. It contains specific references to the particular Contractor supplying said product or service. If no reference is provided then the requirement applies to all Prime Construction Contractors.

## 1.02 CARE AND PLACEMENT

- A. All temporary and permanent facilities and controls and all other elements on the project site shall meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions. The Contractor shall comply with all requirements of the Act.
- B. The Contractor shall take every precaution and shall provide such equipment and facilities as are necessary or required for the safety of its employees and persons at the site.
- C. In the event of damage to existing and/or temporary facilities then immediately make all repairs and replacements to an equal condition prior to the event.

## 1.03 QUALITY PERFORMANCE

- A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction, and all applicable codes, regulations and ordinances.
- B. Secure approvals from the appropriate jurisdictions and utility companies on all repairs, relocations, connections, disconnections and the Work.
- C. All barricades, warning signs, lights, temporary signals and other protective devices shall conform with "Manual on Uniform Traffic Control Devices for Streets and Highways", US Government Printing Office.

## 1.04 SUBMITTALS

- A. The Contractor shall provide a list of contact numbers as follows:
  - 1. Contractor's superintendent and office project manager (home, beeper, cellular, office, fax, trailer, and email address).
  - 2. All subcontractors.
  - 3. All utility companies.
  - 4. Emergency services such as fire department, police, and ambulance.
  - 5. Contractor shall also submit the following:
    - a. Name and qualifications of person or persons who shall be available to render first aid.
    - b. Names, addresses and telephone numbers of personnel who can be telephoned and act on behalf of Contractor in the event of emergencies or other problems requiring prompt attention during winter shutdown, holidays, nights and other periods when the Contractor's superintendent may be absent from the project site.

### 1.05 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the installation, performance, maintenance, and repair of all temporary facilities and controls specified herein this Section as originally provided.
- B. The Owner reserves the right to immediately correct a Contractor caused action, if in the opinion of the Owner, the situation may result in the immediate loss of life, property, and degradation of the environment. The costs for actions taken by the Owner shall be deducted from money due or to become due the Contractor. Amounts in excess shall be paid by the Contractor.
- C. If the Contractor caused situation is not deemed immediate, then the Contractor shall, within 24 hours of receipt of written and/or verbal notice, correct the defect or unsatisfactory condition.
- D. The Owner may repair, correct, replace, or install temporary facilities to correct the situation if the Contractor fails to perform within the allowed time. The costs to make the corrections shall be deducted from money due or to become due the Contractor. Amounts in excess shall be paid by the Contractor.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. The Owner may use temporary power lines, pipes, roadways or other facilities that the Contractor furnishes, installs, and maintains (then removes at the completion of the work), during the period of construction.
- B. The location of all temporary power lines, roadways, and other necessary temporary facilities shall be subject to the approval of the Architect/Engineer, and these shall be located and operated so as not to interfere with the operation of the facilities.

### 2.02 WATER FOR CONSTRUCTION PURPOSES

- A. The Contractor shall obtain water from the nearest potable water source as designated by the Owner.
- B. The Owner will pay for water usage for general construction activities such as dust control and for sanitary purposes, like hand washing.
- C. The Contractor shall install his or her own backflow prevention device at the supply point where it is connected to the Owner's system.
- D. The Contractor shall exercise measures to conserve water.
- E. Provide insulation and heat tracing to prevent freezing of temporary piping. Drain hoses at the end of each use.

### 2.03 SANITARY FACILITIES

- A. The Contractor shall provide and maintain his or her own temporary toilet facilities and enclosures.
- B. These facilities shall be maintained in a strictly sanitary manner and be screened from the general public.

- C. All facilities shall be in accordance with the Occupational Safety and Health Act (OSHA) standards and all other applicable local codes.
- D. The locations of such facilities shall be determined by the Architect/Engineer or the Owner .
- E. All applicable codes and regulations regarding the maintenance and method of waste disposal for these facilities will be strictly enforced. These facilities shall be of the portable type.
- F. The Owner's sanitary facilities will be available for use by any Contractor. Each Contractor shall be required to keep the facilities clean during the period of use.

#### 2.04 HEAT

- A. The Contractor shall provide and pay for heating devices and fuel as required to maintain adequate heat for specific construction operations; i.e. painting, application of coatings, etc. where so specified elsewhere in these specifications.
- B. Maintain minimum ambient temperature of 40 degrees F in areas where construction is in progress, unless otherwise indicated in specifications or as required by proposed working conditions and manufacturer's installation/application instructions.

#### 2.05 VENTILATION

- A. The Contractor shall ventilate enclosed areas to assist in the curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.
- B. The Contractor shall ventilate buildings to safely apply paint in accordance with Section 099100 requirements.

#### 2.06 BARRIERS AND PROTECTION

- A. The Contractor shall provide railings, barricades, signs, fences, overhead protection, walkway covers and other protective devices to prevent unauthorized entry to construction areas, to allow for the Owner's / Public safe use of the site and to protect existing facilities and adjacent structures from damage from the work.
- B. Protect vehicular traffic, stored materials, public utilities, site and structures from damage.

#### 2.07 TEMPORARY FENCING

- A. The Contractor is responsible for performance compliance with OSHA standards.
- B. The Contractor shall provide temporary safety fence around all open excavations or other dangerous conditions on the construction site.
  - 1. All temporary safety fencing shall be designed and erected in compliance with OSHA standards, but in no case less stringent than these specifications for fencing.
  - 2. The fence and supports shall remain the property of the Contractor and be promptly removed at the appropriate time.

#### 2.08 EROSION CONTROL

- A. The Contractor shall provide measures to keep the ground surface well drained, but avoid erosion of embankments, excavations, the project site, and adjacent areas.
- B. The Contractor shall comply with all local codes, rules, and regulations concerning soil erosion.

1. Use hay bales or silt fences to control erosion to the satisfaction of the Architect/Engineer and regulatory agencies. Use hay bales or silt fences to stop silt and sediment from reaching surface waters, parking lots and roads.
  2. Leave erosion control methods in place until ground cover is established or until date of substantial completion.
- C. The Contractor shall install erosion control measures as shown on the Drawings.
- D. Comply with the requirements also contained in Section 015719 - Environmental Protection. Submit an Erosion Control Plan as specified therein and comply with the Project's published Stormwater Pollution Prevention Plan.

## 2.09 DUST CONTROL

- A. The Contractor shall provide measures to control dust resulting from the work.
- B. Control dust at locations and in such quantities and frequencies as required to prevent dust from becoming a nuisance to the surrounding area.
- C. In the event the Contractor does not adequately provide for dust control, or should insufficient quantities of dust control agents be placed and Contractor fails to place additional quantities within 4 hours after Architect/Engineer's direction, Owner will perform the required work by whatever means deemed expedient and all expenses incurred by Owner will be charged to and paid by Contractor.
- D. Take care in selecting and applying dust control agents so as not to make roadways or walkways slippery, muddy or hazardous. Dust control agents shall be acceptable to the Architect/Engineer.

## 2.10 RUBBISH REMOVAL

- A. The Contractor shall be responsible for overall rubbish removal.
- B. Burning of rubbish and trash will not be permitted.
- C. The Contractor shall clean up trash as specified in Section 011400 - Work Restrictions or more often if the trash interferes with the work of others, presents a hazard or if directed by the Architect/Engineer.
- D. Dispose of rubbish and waste materials in accordance with state regulations and local ordinances.

## 2.11 SNOW REMOVAL

- A. The Contractor shall be responsible for maintaining roads, walkways, sidewalks, and parking areas/lots free of snow. Provide snow plowing during and after each snow fall equal to or greater than 1.0 inch as reported by the local weather service.
- B. Any damage resulting from the Contractor's snow clearing operations shall be immediately repaired at no additional cost to the Owner.

## 2.12 ENCLOSURES

- A. The Contractor shall provide and maintain temporary enclosures, sheds, or fenced-in areas to accommodate protection for products, material and equipment.

- B. Store equipment that cannot be exposed to outdoors in accordance with Section 016500 - Product Delivery, Storage and Handling.

### 2.13 SECURITY

- A. The Contractor shall provide security and facilities to protect work from unauthorized entry, vandalism and theft.
- B. Coordinate with Owner's security program, if applicable.
- C. The Contractor has full responsibility for the working area until final acceptance and payment.
- D. It shall be the Contractor's responsibility to lock all gates to the site, and on the access road, at the end of each work day.
- E. All on-site employees shall bear, at all times, an identification badge, conspicuously worn, which shall include, at a minimum, a passport or similar size photograph, the name of the employee and the name of the company.
- F. Any employee working on site without a photo identification badge will be instructed to leave the site.
- G. All company vehicles shall be conspicuously identified, through sufficiently sized lettering on both the passenger and driver sides, with the company name, address and telephone number.
  - 1. All employee owned vehicles shall have an 8-1/2 inch by 11 inch sign with the company name, address and telephone number placed on the dashboard on the driver side.
  - 2. Vehicles may be subject to search by the Owner or owner's representatives.
  - 3. Any vehicle that does not have the company name, address and telephone number will not be permitted on the Owners' property.
- H. Submit to the Owner a complete listing of all employees that will or might be performing work at the project site.
  - 1. Furthermore, provide sufficient information as may be required for the Owner to conduct background checks, in accordance with the Fair Credit Reporting Act.
  - 2. Background checks may be performed at the discretion of the Owner due to the sensitive nature of the work and the extensive, and sometimes unsupervised, access to Owner property and buildings.
  - 3. The Contractor shall be required, on request from the Owner, at any time prior to or during the work, to provide releases from its employees and officers to the Owner, H2M, and a background search firm, hired by either the Owner or H2M, to conduct background checks in accordance with the Fair Credit Reporting Act and applicable state law.

### 2.14 DAMAGES

- A. The Contractor, with the prior approval of the Owner/Architect/Engineer, shall promptly repair any damage, directly or indirectly caused by the Contractor's operations.
- B. All repairs shall be to the complete satisfaction of the Owner and equal in quality to that which pre-existed.

### 2.15 FIRST AID FACILITIES & EMERGENCY TELEPHONE NUMBERS

- A. The Contractor shall provide and maintain adequately equipped first aid facilities in a location or at locations that are readily accessible to workmen, Architect/Engineer and visitors to the site.

- B. Provide at least one on-site employee who is properly trained in first aid and who shall be available to render first aid whenever construction is in progress.
- C. Provide a list of emergency telephone numbers as specified above.
- D. Post the list of emergency telephone numbers as directed by the Architect/Engineer.

#### 2.16 POLLUTION CONTROL

- A. Do not permit pollutants, such as chemicals, fuels, lubricants, calcium chloride, sewage, water containing sediments and other deleterious, poisonous, toxic or oxygen demanding substances to enter or leach into streams, lakes, wetlands, other surface waters, into groundwater, or into the air.

### PART 3 - EXECUTION

#### 3.01 PROTECTION OF EXISTING UTILITIES AND PUBLIC WORKS

- A. Maintain and protect existing utilities and public works including, but not limited to, conduits, sewers, water mains, electric and telephone conductors or conduits, and gas mains encountered during the construction.
- B. In the event that it is not possible to cross over, under, around or otherwise avoid the existing utility, the owner of the utility shall be notified that the utility must be altered or moved.
- C. In the event that damage shall result to any service pipe for water or gas, or any private or public sewer or conduit, the Contractor shall immediately, and at its own expense, repair same to the satisfaction of the Architect/Engineer.
- D. Any contents from the pipes, sewers or conduits shall be immediately removed and disposed in accordance with applicable laws.

#### 3.02 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities and materials, immediately following substantial completion and prior to release of retainage.
- B. Remove underground installations to a minimum depth of 2 feet.
- C. Regrade site to restore to existing slope and elevation, and restore the surface.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.
- F. Remove temporary parking and access roads.
- G. Regrade area to existing slope and elevation and restore the surface to its existing condition.
- H. Final payment will not be processed until all removals have been completed to the satisfaction of the Owner/Architect/Engineer.

#### 3.03 PROTECTION OF EXISTING PROPERTY

- A. Protect existing structures and finishes during performance of the work.

- B. Protect existing trees and plants during performance of the work.
- C. Do not deposit excavated materials or store materials around trees or plants or attach guy wires to trees.

**END OF SECTION 015000**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Control of environmental pollution and damage that the Contractor must consider for air, water, and land resources in preparing a bid and while constructing the project. This Section includes management of site aesthetics, noise, solid and liquid waste and wastewater, and other pollutants that may be generated by the Contractor.
- B. Include all costs associated with environmental protection as specified herein and as specified in other Sections of these specifications in the total price bid.
- C. Comply with all provisions of the Stormwater Pollution Prevention Plan (SWPPP).

## 1.02 DEFINITIONS

- A. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
  - 1. Adversely effect human health or welfare,
  - 2. Unfavorably alter ecological balances of importance to human life,
  - 3. Impact wetlands,
  - 4. Effect other species of importance to man, or;
  - 5. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- B. Definitions of Pollutants:
  - 1. Sediment: Soil and other debris that has been eroded and transported by runoff water.
  - 2. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
  - 3. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
  - 4. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
  - 5. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalies, herbicides, pesticides, organic chemicals, and inorganic wastes.
- C. Sanitary Wastes:
  - 1. Sewage: Domestic sanitary sewage and human and animal waste.
  - 2. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

## 1.03 SUBMITTALS

- A. Submit the following under provisions of Section 013300:
  - 1. Environmental Protection Plan / Erosion Control Plan: After the Contract is awarded and prior to the commencement of the work, meet with the Architect/Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than twenty (20) days after the meeting, prepare and submit to the Architect/Engineer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
    - a. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
    - b. Permits, licenses, and the location of the solid waste disposal area(s).



- c. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.
2. Prepare an Erosion Control Plan describing and showing methods for erosion control that shall be employed by the Contractor to protect adjoining wetlands.
3. Prepare a Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan shall include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
4. Approval of the Contractor's Environmental Protection Plan / Erosion Control Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

### 3.01 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this Contract. Confine activities to areas defined by the Contract Documents.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Architect/Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
- C. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this Contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
- D. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
  1. Box and protect from damage existing trees and shrubs to remain on the construction site.
  2. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
  3. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
- E. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
  1. Temporary Protection of Disturbed Areas: Construct diversion ditches and berms to retard and divert runoff from the construction site to protected wetlands areas as defined in the Clean Water Act and federal, state and local regulations.
  2. Erosion and Sedimentation Control Devices:
    - a. Construct or install all temporary and permanent erosion and sedimentation control features as shown or specified in the Contract Documents and as required by the Owner pursuant to direction of the regulatory authority.

- b. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, hay bales, erosion control fencing, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
  3. Manage borrow areas on and off Owner property to minimize erosion and to prevent sediment from entering nearby property, watercourses and local streets.
  4. Manage and control spoil areas on and off Owner property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby property, watercourses or streets.
  5. Protect adjacent areas from degradation by temporary excavations and embankments.
- F. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment.
  1. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule.
  2. Transport all solid waste off Owners' property and dispose of waste in compliance with Federal, State, and local requirements.
  3. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
  4. Handle discarded materials other than those included in the solid waste category as directed by the Architect/Engineer.
- G. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this Contract.
- H. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
- I. Control movement of materials and equipment during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
- J. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources.
  1. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State and Federal emission and performance laws and standards.
  2. Maintain ambient air quality standards set by the Environmental Protection Agency and State, for those construction operations and activities specified.
- K. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
- L. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinkle, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
- M. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.

- N. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- O. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Architect/Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified in accordance with OSHA and local ordinances, whichever is more restrictive.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 5:00 p.m. unless otherwise permitted by local ordinance or by the Architect/Engineer.
  2. Repetitive impact noise on the property shall not exceed the following dB limitations:
  3. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this Contract, consisting of, but not limited to, the following:
    - a. Use shields or other physical barriers to restrict noise transmission.
    - b. Provide soundproof housings or enclosures for noise-producing machinery.
    - c. Use efficient silencers on equipment air intakes.
    - d. Use and maintain efficient intake and exhaust mufflers on internal combustion engines.
    - e. Line hoppers and storage bins with sound deadening material.
    - f. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

**END OF SECTION 015719**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section includes the general requirements for products that are to be furnished, installed, or otherwise incorporated into the project.

## 1.02 QUALITY ASSURANCE APPLIES TO ALL PRODUCTS

- A. In addition to the Contractor's warranties and guarantees on materials and equipment required under the General Conditions of the Contract and the Technical Specifications contained hereinafter, the Contractor shall also be responsible for all materials, equipment, and products that have or is planned to be incorporated into the work.
  - 1. The Contractor shall be responsible for the finished work and that it accurately and completely complies with these Contract Documents.
  - 2. The Contractor shall be responsible for work performed by subcontractors, equipment suppliers, and material vendors.
  - 3. The Contractor shall be satisfied as to the product's performance before it is ordered for installation. At the Contractor's option, he/she shall have tested each product to determine compliance with these specifications.
- B. The Architect/Engineer may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Architect/Engineer in carrying out such checks.
  - 1. Such checking by the Architect/Engineer shall not relieve the Contractor of any responsibilities for the accuracy or completeness of the work.
  - 2. Such checking is a courtesy service being provided by the Owner and does not relieve the Contractor of his/her responsibilities under this Construction Contract.
- C. If witnessed shop tests or inspections are required at the point of manufacture, the Contractor shall keep the Architect/Engineer advised as to the progress of the work to allow inspection at the proper time and place. Provide at least two (2) weeks advance notice before scheduled shop tests.
- D. Should a dispute arise as to the quality of workmanship, equipment or material performance, then the final decision regarding acceptability with these Contract Documents shall be that of the Owner.
- E. At the request of the Architect/Engineer, the Contractor shall promptly provide the services of a competent representative of the manufacturer at the project site, fully equipped and prepared to answer questions, perform tests, make adjustments and to prove compliance with the Contract Documents free of all additional charges. Proof of compliance shall be the responsibility of the Contractor, and such special visits to the project site by the manufacturer shall not be eligible under any cash allowances or stipulated man-hours necessary to startup the system and/or train the Owner as may be specified in the Technical Specifications.

## 1.03 QUALITY ASSURANCE - EQUIPMENT

- A. Erect and install products under the supervision of a competent and experienced superintendent. The method of installation, including anchorage, clearances, and tolerances for rotating assemblies, methods of support for equipment and adjacent piping, shall be as recommended by the equipment manufacturer unless detailed on the Drawings or specified.
- B. All material furnished shall be new, and guaranteed free from defects in workmanship, installation, and design.

- C. Design and fabricate equipment in conformance with ANSI, ASTM, ASME, ASHRAE, IEEE, NEC and NEMA Standards.
  - 1. Equipment shall withstand the stresses that may occur during fabrication, testing, transportation, installation and conditions of operation.
  - 2. Equipment shall comply with the latest OSHA regulations and the ANSI Safety Standards.
- D. Equipment shall be products of manufacturers who produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the equipment.
- E. Manufacturers shall also have readily available access to suitable and accurate testing facilities for performing the required shop tests.

## PART 2 - PRODUCTS

### 2.01 MATERIALS AND EQUIPMENT

- A. Equipment shall have been in successful regular operation under comparable conditions for a period of at least five (5) years.
  - 1. This time requirement does not apply when the manufacturer posts an Owner/Architect/Engineer acceptable Performance Bond or Letter of Credit for the duration of the time period that will guarantee replacement of the equipment in the event of failure.
  - 2. The bond shall be in a form that is acceptable to the Owner's legal council.
- B. The Owner reserves the right to reject any material or equipment manufacturer who, although he appears to be qualified and meets the technical requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service, as required to suit the operational requirements of the Owner.
- C. Whenever it is required that the Contractor furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable on the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required.
- D. Perform work in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.
- E. Items of any one type of material or equipment shall be the product of a single manufacturer.
  - 1. For ease of the Owner in maintaining and obtaining service for equipment and for obtaining spare parts from as few places as possible, to the maximum extent possible, use equipment of a single manufacturer.
  - 2. The Architect/Engineer reserves the right to reject any equipment from various manufacturers if suitable equipment can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.
- F. Substitute equipment shall not be fabricated nor installed until after written decision to accept request is received from the Architect/Engineer.

### 2.02 NAMEPLATES

- A. Each unit of equipment shall have the manufacturer's name or trademark on a stainless steel nameplate securely affixed in a conspicuous place.

- B. The manufacturer's name or trademark may be cast integrally with stamp, or otherwise permanently marked upon the item of equipment.
- C. Such other information as the manufacturer may consider necessary for complete identification shall be shown on the nameplate.

### 2.03 FABRICATIONS

- A. Insofar as possible, shop prefabricate all items complete and ready for installation.
- B. Accurately fabricate all items to the details shown on the Drawings and on the shop drawings found in compliance with the Contract Documents.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Prior to work under any Section, carefully inspect the existing work and verify that it is complete to the point where the work under that Section may properly commence.
- B. Avoid the need to remove and replace work and to avoid unnecessary cutting and patching.
- C. Inspect all surfaces to be sure that they have been properly prepared before applying new work to such surfaces.
- D. Verify that all work can be installed in strict accordance with the drawings and the approved shop drawings. Immediately report discrepancies to Architect/Engineer.
- E. Do not proceed with the work under any Section until these conditions are obtained.

### 3.02 INSTALLATION

- A. Furnish and install materials and equipment in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.
- B. All work shall be done in a workmanlike manner and set to proper lines and grades. The work shall be square, plumb and/or level as the case may be.
- C. Where performance criteria are specified, do all work necessary to attain the required end results.

### 3.03 FIELD QUALITY CONTROL

- A. Neither observations by Architect/Engineer nor inspections, tests or approvals by other persons shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.
- B. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested or approved by some public body, the Contractor shall assume full responsibility therefore, pay all costs in connection therewith, and furnish the Architect/Engineer with the required certificates of inspection, testing or approval.
- C. The Owner reserves the right to independently perform laboratory tests on random samples of material or performance tests on equipment delivered to the site.

1. These tests, if made, will be conducted in accordance with the appropriate referenced standards or specification requirements.
2. The entire shipment represented by a given sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements.
3. All rejected materials or equipment shall be removed from the site, whether stored or installed in the work, and the required replacements shall be made, all at no additional cost to Owner.

#### 3.04 ADJUST AND CLEAN

- A. Upon the completion of installations, and as a condition of its acceptance, visually inspect all work, adjust all components for proper alignment and touch-up abrasions and scratches to make them completely invisible.
- B. Thoroughly examine all materials and equipment with protective or decorative finishes for defects and damage prior to being covered.
  1. In the case of buried items of work, restore protective surface covers so as to conform to the Contract Documents prior to being backfilled, buried or embedded, as the case may be.
  2. In the case of exposed items of work, for which a decorative finish is required, all scratches, discoloration's, unmatched colors, disfigurements and damages shall be repaired and touched-up so as to provide a neat, clean finish, and be uniform in color.

#### 3.05 UNCOVERING WORK

- A. Unless otherwise specified or directed by Architect/Engineer, no work shall be covered until it has been observed, tested, photographed, measured, and authorized to be covered by Architect/Engineer.
- B. Tie distances to above ground physical structures as reference points to all underground utilities, conduits, pits, manholes, valves, and pipelines shall be obtained by the Contractor prior to covering the work. Immediately comply with the Architect/Engineer's direction to uncover the work if tie distances were not obtained.
- C. If any work has been covered with Architect/Engineer's consent and Architect/Engineer considers it necessary or advisable that covered work be observed or tested, the Contractor, at Architect/Engineer's request, shall uncover, expose or otherwise make available for observation, or testing as Architect/Engineer may require, that portion of the work in question, furnishing all necessary labor, material and equipment.
  1. If it is found that such work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, and testing of satisfactory reconstruction, including compensation for additional engineering services and an appropriate deductive change order shall be issued.
  2. If, however, such work is not found to be defective, the Contractor shall be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction if he makes a claim therefore as provided in the General Conditions.

#### 3.06 DEFECTIVE WORK

- A. The repair, removal, replacement and correction of defective work is a part of this Contract and shall be promptly performed in accordance with the requirements set forth in the General Conditions or other portions of the Contract Documents. All costs in connection with the correction of defective work shall be borne by the Contractor.

- B. Products that fail to maintain the performance or other salient requirements of the Contract Documents, shows undue wear, or other deleterious effects during the maintenance period, shall be considered defective.

**END OF SECTION 016100**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. The Section includes the transportation, handling, storage and protection of products that are to be incorporated into the work.
- B. The procedures for turning equipment over to the Owner for installation by others is also included herein.

## 1.02 GENERAL

- A. Items shall be delivered as complete assemblies direct from the manufacturer with all internal wiring, piping, valving, and control devices intact except where partial disassembly is required by transportation regulations, protection of components, or where physical constraints may exist or be created for the setting of the item.
- B. Coordinate the disassembly and reassembly requirements with the manufacturer. Determine the need and extent of reassembly prior to bid.
  - 1. All labor, material and equipment costs associated with the disassembly and reassembly of the product shall be included in the Contract Price.
  - 2. Where reassembly of equipment is necessary, then the manufacturer shall provide reassembly instruction at the project site.
  - 3. A technician shall be present during the entire reassembly procedure and the manufacturer shall certify, in writing, that the unit was reassembled properly in accordance with instructions provided by the manufacturer and that all as-specified warranties remain in effect.
  - 4. The manufacturer's reassembly inspection time shall be in addition to the field service time specified and shall be included in the Contract Price. This time shall not be eligible for payment under any cash allowance item.
- C. In the case where equipment is to be installed by others, then the supplying contractor shall be responsible for its reassembly. If reassembly is necessary and the unit(s) are to be set inside an enclosure or building, reassemble the equipment inside said enclosure. The equipment once reassembled shall be turned over to the installing contractor as specified below.

## 1.03 PACKING

- A. Transport products in containers, crates, boxes or similar means such that the products are protected against damage that may occur during transportation.
- B. All parts shall be packaged separately or in container where parts of similar systems are grouped.
- C. Part numbers shall be indicated on the individual part. Use indelible ink to mark part numbers.
- D. All equipment shipments shall be included with a parts list showing a description (name) of the part and the manufacturer's part number.
  - 1. The parts list shall be shipped in a plastic zippered envelope with the words "Parts List" lettered on it in indelible ink.
  - 2. The parts list shall be placed inside the shipping container so that it is on the top of the contents.
- E. Equipment shall be shipped with storage, handling and installation instructions.

1. The Engineer reserves the right to withhold payment for equipment delivered to the site until such time as the storage, handling and installation instructions are supplied by the manufacturer.
  2. In the case where operation and maintenance manuals have been provided by the manufacturer, which includes the installation instructions, then the installation instructions shall also be included with the equipment shipment.
- F. Delicate instruments and devices, reagents, chemicals, and glassware shall be shipped in packaging normally provided by the manufacturer.
- G. The Contractor shall require the manufacturer to be responsible for the proper packing of all products.

#### 1.04 SHIPPING AND DELIVERY

- A. Product deliveries shall be accompanied with a bill of lading indicating the place of origination and the Contractor's purchase order number.
- B. Inspect shipments immediately upon delivery, to assure compliance with requirements of the Contract Documents and those products are undamaged.
- C. Promptly remove damaged material and unsuitable items from the job site.
- D. Provide equipment and personnel to handle products by methods to prevent soiling; disfigurement or damage.

#### 1.05 STORAGE

- A. Store sensitive products and all spare parts in weather tight, climate controlled enclosures in an environment favorable to product.
- B. Store and protect products in accordance with the manufacturer's instructions.
- C. All other products that are to be installed underground or products such as pipe, valves, and fittings shall be stored outdoors but shall be blocked off the ground and covered with impervious sheet coverings.
- D. Store fabricated products above the ground on blocking or skids.
- E. Store loose granular materials in well-drained areas on solid surfaces to prevent mixing with foreign matter.
- F. Provide adequate ventilation to avoid condensation.
- G. In accordance with manufacturer's instructions protect bearings, couplings, shafts, rotating components, and assemblies. Protection of said equipment shall be continuous until the time the equipment is placed into permanent service.
- H. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.
- I. Do not store volatile liquids in any building on site.
- J. Storage of products shall be the responsibility of the supplying contractor. The installing contractor shall take all necessary precautions to protect the equipment being furnished by others.

- K. Store with seals and labels intact and legible.

#### 1.06 EQUIPMENT INSTALLED BY OTHERS

- A. All products, except products noted on the Drawings or specified, shall be furnished and installed under this Contract.
  - 1. Only noted or specified products shall be furnished under this Contract for installation by others.
  - 2. If it is not noted on the Drawings or specified, then the product shall be furnished and installed under the Contract.
- B. The Contractor shall furnish these products to the Owner. These products shall be stored as specified above.
- C. The Owner will then advise the installing contractor that the product(s) are ready for installation.
  - 1. In the case where the product is stored in a proper enclosure, but not stored inside the building to be constructed under this project, then the installing contractor shall move the product into the building to a location adjacent to the final location shown on the Drawings.
  - 2. In all cases, the installing contractor shall be responsible for moving from storage, uncrating, anchoring, mounting and installing the product as required by the Contract Documents.
- D. The Contractor and installing contractor(s) shall be present at the time the equipment is turned over to the Owner. Immediately thereafter, the Owner will turn the product over to the installing contractor for installation.
- E. The Owner, Contractor, Architect/Engineer and the installing contractor shall inspect the condition of the product at this time.
  - 1. Any defects in the product will be noted and the Contractor will be advised to make all repairs immediately.
  - 2. The installing contractor shall still be required to install the product if the damage is deemed cosmetic by the Architect/Engineer.
  - 3. The manufacturer's installation instructions or wiring diagram shall be turned over to the installing contractor at this time by the Contractor.
  - 4. Any damage occurring to the product during moving, setting and mounting the unit(s) shall be the responsibility of the installing contractor.
  - 5. The Contractor is advised to take photographs to document the condition prior to it being turned over to the installing contractor.
  - 6. The installing contractor is advised to take photographs to document the condition prior to its acceptance.
- F. The supplied unit(s) remain the property of the Contractor until final acceptance of the work.
- G. Any damage caused to the unit(s) due to improper installation, workmanship, and non-compliance with the manufacturer's written installation instructions shall be the responsibility of the contractor who caused said damage. The burden of proof shall rest with the supplying Contractor.
- H. In the event the Contractor discovers misuse, abuse or improper installation of the unit(s) by the installing contractor, then he shall immediately notify the Architect/Engineer in writing. The Architect/Engineer will investigate the accusations and make a determination. The Architect/Engineer's determination shall be binding and agreed to by both parties.
- I. If the Architect/Engineer's determination substantiates the accusations of the Contractor, then the Contractor shall install the unit(s), the costs for which will be paid for as extra work. All

costs associated with the extra work change order, including engineering and attorney fees of the Owner and Contractor will be deducted from money due the installing contractor.

#### 1.07 PROTECTION OF WORK

- A. The Contractor shall protect the installed work. All costs for protection shall be borne by the Contractor. Provide coverings as necessary to protect installed products from damage, from traffic and subsequent construction operations. Remove when no longer needed.
- B. Cover and protect equipment from dust, moisture or physical damage. Protect finished floor surfaces prior to allowing equipment or materials to be moved over such surfaces. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.
- C. Additional time required to secure replacements and to make repairs will not be considered by the Architect/Engineer to justify any extension in the Contract Time of Completion. In the event of the damage, promptly make replacement and repairs to the approval of the Engineer at no additional costs.

#### PART 2 - PRODUCTS

NOT USED

#### PART 3 - EXECUTION

NOT USED

**END OF SECTION 016500**

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. This Section This Section includes administrative and procedural requirements for cutting and patching.
- B. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition, and does not apply to new construction procedures, except when new construction is already completed and must be cut and patched due to incorrect sequencing of work and/or improper coordination.
- C. Provisions of this Section apply to the construction activities of the Contractor. Contractors are reminded that they will need to hire tradesman skilled in the patching finishes that are impacted by their activities. (e.g. plumber will need to have a mason patch back existing walls opened for new roughing , Heating Contractor will hire carpenter for existing ceiling replacements after new air handler installed, etc )
- D. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section 013100 - PROJECT MANAGEMENT AND COORDINATION for procedures for coordinating cutting and patching with other construction activities.
  - 2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
    - a. Requirements of this Section apply to all trades. Refer to specification sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

## 1.02 RESPONSIBILITIES

- A. General: The Contractor is responsible to perform cutting and patching for their portion of the Work. Patching work shall restore all surfaces to their original condition.
- B. Cutting and patching of completed new construction required due to out of sequence construction and/or improper coordination is the responsibility of the Contractor responsible for the out of sequence construction or improper coordination. Cutting and patching of new construction for these purposes shall be accomplished by the General Construction Contractor and shall be paid for by the Contractor responsible. The Architect shall be the sole judge of the responsibility for such cutting and patching, and shall prepare change orders to delete monies from the responsible prime Contract and credit those monies to the General Construction Contractor.
  - 1. The Contractor shall cooperate with the Architect to accomplish cutting and patching with minimal disruption to the construction and at reasonable cost.

## 1.03 SUBMITTALS

- A. Cutting and Patching Plan: If the Owner requires approval of cutting and patching procedures before proceeding, submit a plan describing cutting and patching procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:
  - 1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
  - 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
  - 3. List products to be used and firms or entities that will perform the work.

4. Indicate dates when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated, including their new locations, and those that will be required to be placed temporarily out-of-service. Indicate how long service will be disrupted and when service will be restored..
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of additional reinforcement with the original structure.
  - a. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.
  - b. Submit a detailed plan, including an area-specific drawing, indicating how dust mitigation and noise control will be handled to prevent disruption/dusting of adjacent areas. Identify routes of waste removal and dumpster locations, material handling from staging area, placement of protections, controls, etc.

#### 1.04 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
  1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
    - a. Bearing and retaining walls.
    - b. Structural concrete.
    - c. Structural steel.
    - d. Lintels.
    - e. Structural decking.
    - f. Miscellaneous structural metals.
    - g. Equipment supports.
    - h. Piping, ductwork, vessels, and equipment
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
  1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
    - a. Primary operational systems and equipment.
    - b. Water, moisture, or vapor barriers.
    - c. Membranes and flashings.
    - d. Fire protection systems.
    - e. Control systems.
    - f. Communication systems.
    - g. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

### 1.05 WARRANTY

- A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner so as not to void any existing or required warranties.
- B. Utilize manufacturer certified installers for work on any existing roof area, which are impacted, to ensure that the owners current warranty is maintained in full force.

## PART 2 - PRODUCTS

### 2.01 MATERIALS, GENERAL

- A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. If identical materials are not available or cannot be used, use materials whose installed performance will be equal to or surpass that of the existing materials.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
  - 1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including but not limited to; Architect, mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

### 3.02 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut, including shoring, lumber, plywood, etc.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with the use of adjoining areas or interruption of free passage to adjoining areas.
- D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

### 3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
  3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
  4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
  5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible or to match existing where exposed for aesthetic appearance. Comply with specified tolerances. Patching will be done utilizing tradesmen skilled for the surface to be patched. (e.g. mason for brickwork, ceramic tile installer for ceramic tile, etc )
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
  2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing. If patched area does not match the adjacent surface, the contractor will refinish the entire wall to achieve a uniform surface.
  3. Where removal of walls or partitions extends one finished area into another, patch and repair floor, ceiling and wall surfaces in the new space. Provide an aligned, flush surface of uniform color and appearance. Provide grinding, leveling and/or self-leveling of surfaces since adjacent room surfaces may vary in elevation. Remove existing floor and wall coverings and ceiling materials and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
  4. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### 3.04 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying primer and paint or other finishing materials. Restore damaged pipe covering to its original condition

### END OF SECTION 017329



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Cleaning during the progress of the work
- B. Cleaning prior to final payment

## 1.02 SCHEDULING

- A. Sequence, schedule, and coordinate final cleaning work with the final cleaning work to be performed by other contractors.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Cleaning materials shall be appropriate to the surface and materials being cleaned.
- B. Provide pads to protect finished surfaces from cleaning materials.

## PART 3 - EXECUTION

## 3.01 PREPARATION

- A. Post signs to advise building occupants if wet and/or slippery floor conditions exist during cleaning operations.

## 3.02 PROGRESS CLEANING

- A. Keep all buildings, enclosures, and confined areas where work is being performed under the Contract free from unattended combustible materials.
- B. Remove rust spots as they develop.

## 3.03 FINAL CLEANING

- A. Remove dust, dirt, grease, stains, paint drips and runs, plastic, labels, tape, glue, rope, and other foreign materials from visible interior and exterior surfaces.
- B. Do not move dust from spot to spot. Remove directly from the surface on which it lies by the most effective mean such as appropriately treated dusting cloths or vacuum tools. When doing high cleaning, do not allow dust to fall from high areas onto furniture and equipment below.
- C. Dismantle and remove all temporary structures, scaffolding, fencing, and equipment. Remove waste materials, rubbish, lumber, block, tools, machinery, and surplus materials.
- D. Perform the following prior to final payment:
  - 1. Broom clean all exterior concrete surfaces and vacuum clean all interior concrete surfaces.
  - 2. Dust and spot clean painted and vinyl covered walls.
  - 3. Clean and polish all unpainted metal on doors such as trim, hardware, kickplates and doorknobs.
  - 4. Vacuum clean carpets and mats.
  - 5. Vacuum clean acoustic ceilings.

6. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
7. Remove foreign material from exterior masonry.
8. Replace all broken and scratched glass and mirrors.
9. Replace all damaged insect screens.
10. Wash and clean interior and exterior window surfaces. All glass shall be clean and free of dirt, grime, streaks and excessive moisture. Wipe drippings and other marks from windowsills, sashes and woodwork. Do not use windowsills in lieu of ladders.
11. Polish bright metal by damp wiping and drying with a suitable cloth. If a polished appearance is not thereby produced, apply appropriate metal polish.
12. Clean and polish all stainless steel surfaces, including control panels supplied under this Contract.
13. Clean furniture and equipment in accordance with manufacturers instructions.
14. Clean all paved roads, lots and drives which were paved as work under this Contract and all existing paved surfaces using a mechanical street cleaner.
15. Repair or repaint damaged pavement markings.
16. Vacuum and clean with a damp cloth light fixtures, including glass and plastic lenses, ceiling and wall mounted lights, cover panels, side panels, louvers, fixture frames and lamps.
17. Clean supply vents and exhaust grilles. Clean gutters and downspouts.
18. Remove all rust spots and stains from new and pre-existing concrete, painted surfaces, and all other surfaces.
19. Clean and polish all new toilet facilities constructed under this project.
20. Inspect interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for use by the Owner. The project will not be considered substantially complete until all final cleaning has been performed.
21. Polish all new handrail installed as work of this contract with a commercially available aluminum cleaner recommended by the railing manufacturer.
22. Clean dirt that has accumulated between grating and grating angles/supports.
23. Vacuum the inside of all control panels provided under this Contract after the panel has been wired.
24. Thoroughly clean all pits, galleries, manholes, pipes, channels, tanks, wells and all structures entered upon.
25. Elevators: Clean all interior surfaces of the car including hoistway doors and services of the corridors on the side of the elevator. Polish all bright metal surfaces. Clean and spray buff resilient tiles. Dust and damp wipe elevator cab doors, walls and bright work.
26. Clean kitchen equipment in public facilities to meet health department requirements.

**END OF SECTION 017423**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Work of this Section includes the following:
  - 1. Starting systems
  - 2. Testing, adjusting, and balancing
  - 3. Updating of manufacturer's operations and maintenance manuals and wiring diagrams

## 1.02 STARTING SYSTEMS

- A. The Contractor shall coordinate, schedule, and sequence the start-up of various equipment and systems.
- B. Where the start-up of a system or piece of equipment is dependent upon the start-up of other system(s) or equipment, then the Contractor shall schedule and sequence the start-ups to coincide.
- C. Notify the Architect/Engineer at least 14 calendar days prior to the start-up of each item or system so that he can schedule the startup with the Owner and utilities.
- D. Where applicable, verify that each piece of equipment or system has been checked for proper:
  - 1. lubrication,
  - 2. drive rotation,
  - 3. belt tension,
  - 4. motor starter heater size,
  - 5. fuse size,
  - 6. water pressures,
  - 7. terminal connections,
  - 8. control sequence,
  - 9. for conditions which may cause damage or delay the start-up procedure.
- E. Verify that the equipment has been installed in accordance with the manufacturer's requirements.
- F. Complete all pre-startup checklists that may be required by the system vendor.
  - 1. In the event that start-up activities are delayed as a result of the Contractor's failure to properly check the completed installation and a manufacturer's representative is on the job site waiting for corrections to be made, then the Architect/Engineer may, at his/her sole discretion, postpone start-up until such time as the corrections have been made without any extra costs.
  - 2. The Owner may deduct from money due the Contractor the excess cost of engineering associated with having the Architect/Engineer present during the start-up.
  - 3. The deduction shall be equal to the Architect/Engineer's effective billing rate times the total number of hours delayed during the start-up activities.
- G. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- H. Verify that wiring and support components for equipment are complete and tested.
- I. Execute start-up under supervision of applicable Contractor's personnel in accordance with manufacturer's instructions.
- J. The Contractor shall have the job site superintendent present during all start-up activities.

- K. Provide manufacturer's authorized technician at the site when specified and in accordance with the requirements contained in Section 014500 - Quality Control.
- L. Submit manufacturer's start-up reports (MSR's) in accordance with Section 013300.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**END OF SECTION 017500**

## PART 1 - GENERAL

## 1.01 SUBMITTALS

- A. Submit the following documents to the Architect/Engineer before Substantial Completion:
1. Project Record Documents as specified in Section 017839.
  2. Operations and Maintenance Manuals prepared in accordance with Section 017823 and be updated as a result of start-up activities.
  3. Manufacturer's Start-up Reports (MSR's) for all equipment and systems where manufacturer field time is specified.
    - a. Each MSR shall be signed by the field technician(s) who attended the start-up.
    - b. If the manufacturer is taking exception to the installation or if the warranty is voided, he shall provide a statement to that effect and provide reasons and justification to explain the company's position.
  4. One binder containing original counterparts of all warranties, guarantees, bonds, or affidavits as specified in the Technical Specification Sections. These documents shall contain the original signatures and be placed in a plastic sheet protector, one document per protector.
  5. Spare parts checklist itemizing all spare parts furnished under the Contract summarized by Section.
  6. Electrical Underwriter's Certificate where the prime construction contract includes electrical construction.
- B. Submit the following items to the Architect/Engineer with the final application for payment:
1. Federal, state, county, town and local signoffs and inspection approvals, where applicable.
  2. Final Application for Payment and continuation (G702 and G703)
  3. OSHA cards for all workers
  4. Contractor's Affidavit of Payment of Debts and Claims (G706)
  5. Contractor's Affidavit of Release of Liens (G706A)
  6. Final list of Subcontractors (G705)
  7. Subcontractor's Affidavit of Payment of Debts and Claims (G706) - (for each subcontractor used)
  8. Subcontractor's Affidavit of Release of Liens (G706A) - (for each subcontractor used)
  9. Consent of Surety to Final Payment (G707)
  10. 2 year Maintenance Bond - 100% of contract including change orders
  11. Contractors letter guaranteeing workmanship 2 years
  12. Product data, Maintenance manuals and Warranty Information
  13. As Built Documentation
  14. Attic Stock / Spare Parts (provide proof of delivery transmittal signed by owner)
  15. Training and Demonstrations (provide sign-in from training session)
  16. Asbestos Affidavit and waste manifests
- C. All documents shall be complete, signed, dated, and notarized (where applicable) and be subject to the Architect/Engineer's acknowledgment of receipt or approval.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

NOT USED

**END OF SECTION 017800**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section specifies the requirements for Operations and Maintenance Manuals required to be prepared by system suppliers and equipment manufacturers.
- B. The Contractor shall submit Operations and Maintenance Manuals for all equipment.
- C. Where the technical specifications call for the submission of manuals, said manuals shall be prepared in accordance with the requirements contained herein. It being understood that manuals shall be submitted for all equipment even if it is not specifically called out in the specifications.

## 1.02 MANUAL CONTENTS AND FORMAT

- A. All Operations and Maintenance Manuals shall be as specified hereinafter.
- B. The binder shall be 8 1/2" x 11", metal hinge, vinyl, large capacity by National or Equal. It shall show the name of the manufacturer or supplier and project name on the spine of the binder.
- C. A cover shall be provided showing the names of the Owner, Architect/Engineer, Contractor, and Manufacturer.
  - 1. It shall show the Contractor's order number and manufacturer's project number.
  - 2. The address of the manufacturer, service station telephone number, project title, contract number, and year shall also be shown.
- D. Provide tabbed color dividers for each separate product and system.
  - 1. The name of the product shall be typed on the tab.
  - 2. A separate tab shall also be provided for information such as troubleshooting instructions, spare parts list, etc.
- E. An index shall be provided in the back of the binder, with a separate tab, providing a quick way for the operator to find key and important topics contained in the manual.
- F. A separate listing for all charts, graphs, tables, figures and shop drawings shall be provided directly following the table of contents.
- G. Each manual shall contain one (1) copy of all shop drawings deemed in compliance with the Contract Documents by the Architect/Engineer submitted for the equipment or system for which the manual is prepared.
  - 1. Only these shop drawings shall be included in the manual.
  - 2. All shop drawings larger than 8 1/2" x 11" shall be folded and placed in a heavy duty, top loading plastic sheet protector with the title of the drawing showing; one (1) drawing per protector page.
- H. For systems being furnished with control panels, each manual shall contain a catalog cut for every electrical device installed inside the control panel or motor control center.
- I. Where emergency generator(s) are included as work of this Contract, the manufacturer's standard manual will be allowed if the manual clearly shows the instructions for the particular model of generator. Cross out chapters and paragraphs that do not apply to the Owner's generator.
- J. Each manual shall contain the following as a minimum:
  - 1. Table of contents

2. Final version of the warranty statement approved by the Architect/Engineer
  3. Nameplate data of each component, year of installation, contract number and specification number
  4. Name, address and telephone number of the manufacturer and the manufacturer's local representative(s)
  5. Installation instructions
  6. Operation instructions including adjustments, the interrelation of components and the control sequence describing break-in, start-up, operation and shutdown
  7. Emergency operating instructions and capabilities
  8. Maintenance requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing, and checking instructions
  9. Troubleshooting guide and corrective maintenance (repair) procedures for all electrical and mechanical equipment. These guides shall list the most frequent and common problems, together with the symptoms, possible causes of the trouble, and remedies
  10. Drawings (pictures or exploded views) which clearly depict and identify each part, suitable for assembly and disassembly of entire system and each component
  11. Wiring and control diagrams, if applicable
  12. Panelboard circuit directories including electrical service characteristics, if applicable
  13. Part list with current prices; ordering information; and recommended quantities of spare parts to be maintained in storage
  14. Charts of valve tag numbers, with location and function of each valve, keyed to the process and instrumentation diagram prepared as part of the Contract Documents
  15. Name, address, and telephone number of nearest parts supply house and nearest authorized repair service center.
  16. List of recommended spare parts and the recommended number of each per unit and per group of units.
- K. All electronic Operations and Maintenance Manuals shall be as specified hereinafter.
1. All files shall be in Adobe PDF format and submitted on compact discs.
  2. Files shall be organized by specification section and then by product.
  3. An electronic index and list of all charts, graphs, tables, figures, and shop drawings shall be included.
  4. All information provided in the paper Operations and Maintenance Manual shall be included in the electronic version.
- L. Submit two (2) copies of a preliminary draft manual at least fourteen (14) calendar days prior to the date set for start-up.
1. The Architect/Engineer will review the manual for content and compliance with these specifications.
  2. Written comments will be provided, but the manual will not be returned.
  3. One (1) manual will be used at start-up, to record changes that should be made to the final manual.
  4. This copy of the manual will be retained on the site until such time as the final, updated manual is provided.
- M. Two (2) weeks after the date the unit was placed into service and the Owner has gained beneficial use, submit five (5) copies of the final updated Operations and Maintenance Manual. Refer to Section 017500 - Starting and Adjusting for requirements related to updating the manual(s).
- N. Where installation instructions are not included with the manual, they shall be shipped at least ten (10) days prior to the date the equipment is scheduled for installation.

1.03 RETAINAGE

- A. The Architect/Engineer will retain from payment due the Contractor, for failure to submit manuals as specified, an amount equal to 2% of the scheduled value for the equipment or system for which the manual applies. This Contract requirement only applies when a manual is specified to be provided in the Technical Specifications for a particular system or piece of equipment.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**END OF SECTION 017823**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. This Section includes:
  - 1. Maintenance of documents
  - 2. Recording of record information
  - 3. Submission of record documents

## 1.02 PLANS AND SPECIFICATIONS FURNISHED TO THE CONTRACTOR

- A. Two (2) complete sets of Contract Documents (plans, specifications and addenda) will be furnished to the Contractor.
- B. Additional sets will be furnished to the Contractor at \$250 per set.

## 1.03 MAINTENANCE OF DOCUMENTS

- A. The Contractor shall maintain at the site one (1) set of the following: drawings, specifications, addenda, change orders, approved shop drawings, test reports, operations and maintenance manuals, and shop drawing log.
- B. The Contractor shall make these documents available for use by the Owner, Architect/Engineer, regulatory agencies and other parties designated by the Owner.
- C. Provide a drawing rack for storage of plans.
- D. Maintain these documents in a clean, dry, legible condition throughout the entire contract period.

## 1.04 RECORDING OF RECORD INFORMATION

- A. Affix a stamp to each Contract Drawing and Shop Drawing reading as follows: "RECORD DOCUMENT" - "NAME OF PROJECT" - "CONTRACTOR NAME" in 2-inch high printed letters. The stamp shall be specifically prepared for this project.
- B. Keep the record documents current as the work progresses. Record information concurrent with construction progress.
- C. Do not permanently conceal any work until required information has been recorded.
- D. Legibly mark the Contract Plans to record actual construction, including, but not limited to the following:
  - 1. All as-built work.
  - 2. All approved field changes and conditions.
  - 3. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
  - 4. Location of underground conduits, boxes, devices. Wire sizes (AWG) and types installed. Number of active and spare wires in each conduit and conduit size (applicable where work involves electrical construction).
  - 5. Tied-down location of all underground process lines and buried valves.
- E. Shop Drawings: Maintain as record documents. Legibly mark-up to show changes made due to field conditions encountered during construction.

- F. As work progresses, the contractor shall maintain an on the field set of hard copy drawings, a complete and accurate set of field notes clearly delineating all work as it is actually installed. This set of drawings shall be available at all times for the engineer to review and shall be examined at all jobsite meetings.

#### 1.05 PROJECT RECORD DOCUMENTS

- A. Maintain a complete and accurate log of control and survey work as it progresses.
- B. The Contractor shall on completion of major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction, site work and underground facilities installed as work of Contract G.
- C. The Contractor's surveyor site drawings shall also show the location of property line perimeter fence. The property line of the site shall be indicated on the plans.

#### 1.06 SUBMITTAL OF RECORD DOCUMENTS

- A. At Substantial Completion, the Contractor shall deliver one (1) preliminary record set of as-built documents to the Architect/Engineer with all changes conspicuously ballooned or otherwise emphasized.
- B. The work will not be considered substantially complete until such time as the preliminary record documents are delivered and acceptable to the Architect/Engineer. Mark this set "Preliminary Record Drawings".
- C. Prior to Final Completion, the Contractor shall conform the preliminary record drawings to the comments made by the Architect/Engineer and then provide the Owner a complete reproducible set of as-built drawings on mylar (or mylar sepia) and one set of blue line prints.
- D. As-built drawings shall be the same size as the Contract Drawings, with 1/2-inch margins space on three sides and a 2-inch margin on the left side for binding.
- E. Each drawing shall bear in the title box the words "FINAL RECORD DRAWINGS" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.
- F. As a convenience, Architect/Engineer will make available to the Contractor mylar sepias or electronic media of the Contract Drawings for the sole purpose of the Contractor preparing as-built drawings.
- G. Electronic media made available is without guarantee of compatibility with the Contractor's software or hardware.
  - 1. If the Contractor wishes to take advantage of this offer, the Contractor will be required to execute an indemnification and hold harmless agreement with the Architect/Engineer.
  - 2. Pay the Architect/Engineer \$20.00 per Contract Drawing sheet to cover the cost of providing mylar sepias.
  - 3. Electronic media will be provided free of charge on disc in a zipped format.
  - 4. Payment shall be by check, payable to H2M architects + engineers, in advance of picking up the requested materials.
  - 5. Electronic media shall be returned to the Architect/Engineer upon acceptance of the as-built drawings by the Owner.

## 1.07 RELATED DOCUMENTS

- A. Provide certificate of release of liens if requested by the Architect/Engineer.

## 1.08 UNDERGROUND PIPELINE DOCUMENTATION

- A. The General Contractor shall document the location of all underground pipelines by taking digital photographs of the installed pipelines prior to backfilling. At least 3 digital photographs shall be taken of each pipe section before it has been backfilled.
- B. In addition, the underground piping shall be marked with construction grade spray paint before the photos have been taken to indicate the pipelines in the pictures.
  - 1. The Contractor shall assign a separate paint color to each line to be shown in the picture.
  - 2. The paint color, once selected by the Contractor, shall be used for the entire run of piping.
  - 3. The marks shall be large and long enough to be visible in the picture. Where practical, spray paint the name of the contents that will be conveyed in the pipe, e.g. "POTABLE WATER", "BACKWASH EFFL."

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

NOT USED

**END OF SECTION 017839**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. The Section includes the requirements for delivering spare parts specified to be furnished under the provisions of the Contract Documents.

## 1.02 QUALITY ASSURANCE

- A. Spare parts shall be delivered as complete assemblies direct from the manufacturer such that the part is fully functional and ready to be installed.

## 1.03 DELIVERY, STORAGE AND HANDLING OF SPARE PARTS

- A. Comply with the requirements of Section 016500 for packing, delivery, storage and handling requirements for all parts delivered to the site of the work.
- B. All spare parts required to be furnished under a Section of the Specifications shall be packaged in one separate box, crate or container with the words "SPARE PARTS" lettered on all sides of the container.
- C. The equipment name or system name for which the spare parts are being provided shall also be lettered on the container.
- D. A separate packing list for the spare parts shall be included in the container.
- E. The Contractor shall store all spare parts indoors immediately upon delivery of the spare parts to the site. Spare parts will not be accepted by the Owner/Architect/Engineer if the spare parts have been stored outdoors for more than 8 hours upon delivery to the site.
- F. The storage location shall be secure.

## 1.04 TURN OVER OF SPARE PARTS

- A. The following procedure shall be followed:
  - 1. The Contractor shall provide a formal letter of transmittal listing the name or description of the part, part number, model number, manufacturer (or supplier), and system component name and the Section where it was specified to be provided.
  - 2. The Owner/Architect/Engineer will initial next to the part description on each counterpart of the transmittal letter.
  - 3. The initials represent that the part was received.
  - 4. One transmittal counterpart will be returned to the Contractor.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

NOT USED

**END OF SECTION 017843**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for demonstrating and training of installed systems, equipment, and products.
- B. Manufacturer field services and the credit for unused service time is also included herein.

## 1.02 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification sections require field services to be provided, said services shall be provided by qualified, authorized and factory trained representative(s) of the manufacturer (supplier).
- B. Field services shall generally consist of:
  - 1. installation supervision,
  - 2. verify terms of the manufacturer's warranty,
  - 3. equipment and system calibration,
  - 4. startup supervision,
  - 5. and operation and maintenance instructions to the Owner's employees.
- C. Such services do not include service time to correct a factory fault, correct problems resulting from a factory wiring or control logic error, or errors caused by poor or improper installation by the Contractor.
- D. Sale representatives are not acceptable.
- E. The time specified to be provided under the specification sections shall be exclusive of travel time to and from the facility or site. For the purposes of this Contract, one (1) day shall be defined as eight (8) hours exclusive of breaks or mealtime.
- F. The times specified to be provided by the manufacturer does not relieve the manufacturer from providing sufficient service time to place the equipment or systems into satisfactory operation and to obtain the specified performance. The manufacturer shall provide, as a minimum, the times specified in the Specification Sections.
- G. Submit manufacturers' startup reports (MSR's) in accordance with the requirements contained in Section 013300 - Submittals.

## 1.03 SUBMITTALS

- A. The Contractor shall prepare a list of all manufacturer specified field time required by the technical specifications. Compile this summary listing and submit it to the Engineer for review in accordance with the requirements contained in Section 013300.
- B. Manufacturer's Startup Reports

## 1.04 QUALITY CONTROL

- A. The Contractor shall adhere to all instructions provided by the manufacturer's authorized representative.
- B. All verbal instructions necessary to satisfy performance of the equipment or the system shall be immediately provided by the Contractor. The manufacturer shall document all verbal orders in writing at a time suitable to the Contractor.

- C. All written instructions provided in operation, maintenance, and installation guides and manuals, provided by the manufacturer of such equipment and or system, shall be complied with by the Contractor.
- D. The Contractor shall comply with all manufacturer requirements such that written or implied warranties remain in full force during the time period so specified elsewhere in the technical specifications.
- E. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Actions and/or non performance by the Contractor that may void manufacturer warranties shall not constitute a release of the specified warranty, and all warranty claims made by the Owner shall be paid for by the Contractor as if the manufacturer's warranty was still in effect.

#### 1.05 SCHEDULING - FIELD SERVICES

- A. The Contractor shall arrange field service on dates acceptable to the Owner and Architect/Engineer.
- B. The service visits shall be scheduled at least 2 weeks in advance so that the Owner and Architect/Engineer can adequately staff the date.
- C. Operator training will not be allowed until such time as the Manufacturer's Operation and Maintenance Manuals have been supplied and approved by the Architect/Engineer.
  - 1. The field service technician shall review the contents of the manual with designated employees of the Owner.
  - 2. Field services will not be deemed provided until the MSR is provided.

#### 1.06 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.
- B. Utilize manufacturer's and vendor's Operation and Maintenance Manuals as basis for instruction. Review contents of the manual with the Owner's personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of the equipment or of the system.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- E. The Contractor shall arrange to have the manufacturer's Operation and Maintenance Manuals updated with information that has been added during start-up activities.
- F. The final manual shall contain the most recent information and reflect all operational and maintenance aspects of the final installed and functioning system or equipment component of the system.
- G. Any changes to control panel wiring diagrams or interconnection wiring schematics shall be made and new prints provided as an update to previously approved manuals.
- H. Manufacturer field time shall be as specified in individual Sections of the Technical Specifications.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

**END OF SECTION 017900**

## PART 1 – GENERAL

## 1.01 SUMMARY

- A. The systems installed under Divisions 23 and 26, as well as pieces of equipment provided under other Divisions that connect to or interface with the systems of Division 23 and 26 will be evaluated, started, and tested (commissioned) to ensure that each performs per the intent of the design and/or representations made relative to performance, efficiency, and suitability for application in this project.
- B. Owner will employ an independent Commissioning Authority (CA). The CA is an independent and knowledgeable third party, hired to verify that the systems work as per the design intent and provide the requirements of the commissioning responsibilities as designated in this specification. The CA will inform the Owner of the results of the commissioning, and provide suggestions, as necessary, to correct deficiencies in observed performance or installation.

Commissioning Objectives

Commissioning is intended to achieve the following specific objectives:

- 1. The Owner will ultimately inherit a building that is designed to meet the needs of the user and is built and functions as designed.
  - 2. Systems performance expectations are clearly established.
  - 3. The users, project managers, operating personnel, contractors and designers will be protected from any dislocation created by the fragmented corrections and undocumented deficiencies.
  - 4. Corrective actions will be made in a manner that will not compromise long-term utilization or operating expense.
  - 5. The Owner's operating personnel will have the integrated system training needed to confidently operate and maintain the systems.
- C. The CA will be employed directly by the Owner or Owner's Representative to perform commissioning duties. Sections 230800 and 260800 outline the specific commissioning responsibilities of each Contractor for that division, and also obligate the General Contractor/Construction Manager to coordinate and manage the commissioning responsibilities of those subcontractors.
    - 1. This section of the specification describes the process for commissioning and defines the responsibilities of the construction team, including the Construction Manager.
    - 2. The commissioning process shall be applied to all equipment, components, and systems as listed in this section, including specific interfaces to and from equipment and systems provided under separate contracts.
    - 3. Building Commissioning work is a joint team effort to ensure that all systems function together properly to meet the design intent, and to document system performance parameters for fine-tuning of control sequences and operations procedures. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, training, and performance testing. This section does not supersede other requirements of the specifications. It may, though, expand on some of them.
    - 4. Complementary to the Contractor's responsibility to commission the building systems, it should be noted that an Owner's CA will be involved. This Owner's CA will provide equipment-systems installation inspection and performance verification. **These Owner's verifications will be a prerequisite to final equipment and systems acceptance by the Owner as per design documents.** It should be emphasized that this Owner's systems verification does not negate the Contractor's obligations to fully commission the building systems or relieve them of any contractual obligations. The Contractor's personnel shall be made available to execute all aspects of the Commissioning Process until the Owner and the Engineer of Record accept the final results. Commissioning Program tasks and meetings may be repeated until the Owner and the Engineer of Record are satisfied and will not be fixed as one time, one chance events for the Contractor.



5. The Owner's CA will verify equipment-systems installation and performance after the Contractor provides written notice that the building equipment and systems have been completed, tested and are fully operational. Upon this notification, Owner's CA will verify the installation and performance of the equipment and system(s). If corrections are required after the initial verification, the Owner's CA will provide one (1) additional installation and performance verification. Subsequent installation and performance verifications will be at the Contractor's expense. The Contractor is responsible for all systems and equipment until final acceptance by both the Engineer of Record and the Owner. All guarantees and warranties shall not begin until final acceptance by both the Engineer of Record and the Owner.

## 1.02 CONSTRUCTION TEAM RESPONSIBILITIES

- A. Within four (4) weeks of the award of the contract, the Contractor shall submit the names of the Project Manager who will be the commissioning coordinator for this project, as well as the names, addresses, phone numbers and qualifications of subcontractors' representatives and factory trained manufacturers' representatives for all equipment and systems required to participate in the commissioning process as specified in this Section.
- B. The Contractor, and all his sub-trades and suppliers, shall cooperate with the CA in carrying out the commissioning process. In this context, each Contractor shall:
  1. Provide equipment and systems start-up as specified.
  2. Operate equipment and systems as required for initial systems operations and for final functional performance tests as they are performed by the CA, including the on-site participation of approved factory trained manufacturer's representatives for equipment.
  3. Attend commissioning meetings, and attend to action items arising from them, as required to allow the commissioning process to proceed on schedule.
  4. Provide instruction and demonstrations for the Owner's designated operating staff, in conjunction with the CA, in order to meet all specified training requirements in this regard.
  5. The Contractors shall make any and all necessary corrections to systems, equipment, O & M manuals, as built drawings, and procedures as necessary to meet the design intent, contract documents, or performance requirements if errors are discovered during the commissioning process.
  6. The Contractors shall supply all necessary documentation, such as shop drawings, submittal data, maintenance manuals, etc., required for equipment and systems to the CA for preparation of the commissioning plan, checklists, and functional performance plans.
  7. The Contractors shall provide the required names, addresses and qualifications of all specified Manufacturer's Representatives to participate in the commissioning process prior to the initial commissioning meeting.
  8. Subsequent installation and performance verifications, made necessary due to required corrections after initial verification, shall be at the respective Contractor's expense.
- C. The Contractor shall provide to the CA three (3) copies of the following items as soon as they become available:
  1. Construction schedule, including sub-schedules and milestones for all major mechanical and electrical equipment. (i.e. boilers, motor control center, air handlers, generators, VAV boxes, etc.)
  2. Certified and approved start-up and testing reports for all subsystem equipment that comprise the System.
  3. Control schematics and sequences of operation for the total system and all subsystems.
  4. Records of required inspections for code compliance, and documentation of approved permits and licenses to operate components of the System.
  5. Operating data which shall include all necessary instructions to the Owner's operating staff in order to operate the system to specified performance standards.

6. Maintenance data which shall include all necessary information required to maintain all equipment in continuous operation, such as the testing, balancing and adjusting report and the as-built drawings.
7. Written notices that building equipment and systems have been completed, tested, and are fully operational. At the discretion of the CA, this may be the completed pre-functional checklist by the contractor.
8. Checklist of all submitted contract deliverables, such as manuals, spare parts, training, documentation, etc.

### 1.03 COMMISSIONING TEAM MEMBERS

The members of the commissioning team consist of the CA and support staff, Project Managers (PM), and Maintenance & Operating staff, assigned members of the construction manager (CM), the design team (A/E) (particularly the mechanical / electrical engineer), Testing and Balancing Contractor (TAB), Primary trades and other installing subcontractors or suppliers of equipment (Subs).

1. Commissioning Authority
2. School Operations Staff
3. Construction Manager
4. Architectural and Engineering Design Team
5. HVAC Contractor
6. Control's Contractor
7. Testing and balancing Contractor
8. Plumbing Contractor
9. Electrical Contractor
10. Selected Equipment Manufacturers

### 1.04 CONSTRUCTION MANAGER'S RESPONSIBILITY

- A. Cooperate with the CA personnel, provide access to work, and provide adequate time in the work for commissioning tasks.
- B. Include the cost for commissioning requirements of construction manager in the contract price.
- C. Ensure cooperation between the subcontractors and the commissioning team
- D. Attend commissioning specific pre-construction, planning and testing meetings. Provide input into the master scheduling process with regard to the timing and duration of the commissioning activities.
- E. Work with the Owner and the CA to schedule each training session with the appropriate O&M personnel.
- F. Provide written documentation that the systems are complete and ready for functional testing verification.
- G. Correct all Contractor related deficiencies identified during any stage of the commissioning process.
- H. Furnish copies of all shop drawings, manufacturers' literature, maintenance information, or other information as may be requested.
- I. Provide qualified personnel for assistance to complete the commissioning tests, including seasonal testing.
- J. Coordinate the trades as per the CA's testing and pre-testing responsibilities.

- K. Provide training with the assistance of the CA as outlined in Divisions 23 and 26.
- L. Provide to the CA all proprietary test equipment required by manufacturers to test their equipment.
- M. Provide casual labor and facilities:
  - 1. To provide access to work to be tested.
  - 2. For CA's exclusive use, for storage of instruments and drawings, and preparation of daily reports.
- N. The CM shall provide a qualified individual to function as the MEP Coordinator to coordinate the Commissioning Program with the CA for those systems included in Divisions 23 and 26.
- O. The CM shall execute the Commissioning Program, through organization of all meetings, tests, demonstrations, training events, and performance verifications described in the Contract Documents and approved Commissioning Program. Organizational responsibilities include preparation of agendas, attendance lists, arrangements for facilities and timely notification to participants for each Commissioning event.
- P. The CM, MEP Coordinator and all Subcontractors shall review the plans and specifications with respect to the completeness in all areas relating to the Commissioning Program. This includes ensuring that there are adequate items included in the design to ensure the ability to properly test, balance, and adjust the systems and to document the performance of each piece of equipment and each system. Any items that are required for Commissioning but not shown shall be brought to the attention of the CA and Engineer of Record (ER) prior to submittal of shop drawings. Likewise, any items that are required for Commissioning but not installed shall be provided at no additional cost to the project as per design intent.
- Q. The CM shall schedule a Pre-Commissioning Coordination Meeting within 90 days of the award of the contract, at the site and at a time suitable to all parties. This Pre-Commissioning Meeting will be for the purpose of reviewing the complete Commissioning Program and establishing tentative schedules for Maintenance Orientation and inspections, O & M submittals, training sessions, system flushing and testing, job completion, system startup, and test, adjust and balance work.
- R. The CM and Coordinator will review and all functional performance tests, results, and documentation required by the contract documents, for all equipment and systems, as performed by subcontractors, vendors, etc. Develop schedules for all testing, integrate testing into the master construction activity schedule, and fully coordinate all subcontractors testing as required.
- S. The CM and Coordinator shall submit Systems Testing Documentation Forms, schedules, and other commissioning documentation using the shop drawing submittal process, for approval by the ER and CA six months prior to starting any testing required by Divisions 23 and 26. The Owner, ER and CA reserve the right to require changes in the personnel assigned at any time to maintain quality assurance within the Commissioning Program at no additional cost to the project.
- T. The CM shall coordinate directly with each subcontractor on the project specific to their responsibilities and contractual obligations. All contractors shall provide qualified personnel for participation in systems tests, including seasonal testing required after the initial testing.
- U. The CM, MEP Coordinator and all Subcontractors shall provide technical expertise to oversee, direct, and implement the correction of deficiencies found during the commissioning process. Observe the start-up and initial testing of equipment by the Contactor and Subcontractors and

then all final HVAC, building automation, electrical, etc. The Contractor's personnel shall be made available to execute all aspects of the Commissioning Program until the ER and Owner accepts the final results. Commissioning Program tasks and meetings may be repeated until the ER and CA are satisfied and will not be fixed as one-time, one-chance events for the Contractor.

- V. Note any inconsistencies or deficiencies in system operations and enforce system compliance or recommend to the ER modifications to system design which will improve system performance.
- W. The CM shall coordinate through the Owner, CA and ER testing participation. When performance tests, results, and forms of documentation required by the contract documents are completed by the MEP Coordinator, the Owner, ER, and CA shall be notified. After such time, the CA will conduct systems performance verification.
- X. In the event that a performance verification test by the CA fails, the cause of failure shall be determined by the CM and rectified as soon as possible, and then re-tested.
- Y. The CM shall assemble all record drawings and all records of Code authority inspections and approvals. The CM and MEP Coordinator shall review operation and maintenance information and as-built drawings and obtain all documentation from tests and assemble a final submittal to the ER, Owner, and CA for approval. The CM shall document warranty start and dates.
- Z. The CM shall oversee and/or provide training for the systems specified in Divisions 23 and 26.

#### 1.05 COMMISSIONING AUTHORITY'S DUTIES

- A. The CA is contracted directly with the Owner's representative.
- B. The CA shall develop and submit a detailed commissioning plan that would include all system testing requirements including, pre-functional and functional testing sheets, responsibilities, O&M manual and training requirements and forms.
- C. The CA shall execute the Commissioning Program, through organization of all meetings, tests, demonstrations, performance verification as described within.
- D. The CA shall be responsible for developing Pre-functional and Functional test procedures for all equipment and systems. Test procedures shall be in accordance with the manufacturer's recommendations, and shall fully describe the system configurations and tests for each component and system. Each test procedures shall include: specific criteria to be tested for; measured test results verses design requirements; pre-functional test sheets; approved submittal; and Contractor required testing.
- E. The CA shall develop and maintain the commissioning schedule that shall be updated during each commissioning meeting. The commissioning schedule shall be a copy of the General Contractor/Construction Manager schedule.
- F. The CA shall review all shop drawings, coordination drawings and submittals for completeness, accuracy and operational accessibility. All deficiencies shall be documented and submitted to the engineer for review.
- G. The CA shall coordinate directly with the CM during the commissioning meetings (and the subcontractors) to develop the commissioning requirements and schedules. All Contractors shall provide qualified personnel for participation in the system tests, including seasonal testing.

- H. At their discretion, the CA shall witness all Contractor required testing including; piping hydrostatic and duct leakage tests. The Contractors shall be responsible for coordinating these tests with the CA.
- I. At their discretion, the CA shall participate in any factory testing (i.e. Air-handling factory testing) as identified by the Owner. The CA shall coordinate any factory testing with the subcontractors and the CM.
- J. The CA shall review the record drawings and "as-built" documentation for clarity and accuracy. Any discrepancies identified during this review shall be documented and shall be returned for resubmission.
- K. The CA shall review, if appropriate, all operational and maintenance manuals for pre-approval prior to submission to the Engineer. Any discrepancies identified during this review shall be documentation and returned to the Contractors for resubmission.
- L. The CA will perform regular construction installation inspections during the construction timetable and include any identified deficiencies in the regular commissioning meetings. These items shall be reviewed and discussed during the commissioning meeting.
- M. The CA shall participate in the TAB process and perform random sampling of air and water testing to ensure completeness of services.
- N. The CA shall work with the control's Contractor to perform a point-to-point verification of the building's automation system once the control's Contractor submits in writing that their point-to-point is complete.
- O. The CA shall cooperate with Architect and Contractor; provide qualified personnel when scheduled.
- P. The CA shall promptly notify Architect and Contractor of irregularities or deficiencies of work, which are observed during performance of services.
- Q. The CA will test all systems as defined in the Commissioning Plan and the written functional test procedures.
- R. The CA shall work directly with the Owner's Representative and Commissioning Team to provide resolution of deficiencies and provide recommendations to the team.
- S. The CA is not authorized to:
  - 1. Release, revoke, alter, or expand requirements of Contract Documents.
  - 2. Approve or accept any portion of work.
  - 3. Perform any duties of the Contractor.

#### 1.06 SYSTEMS TO BE COMMISSIONED

- A. Indoor Air Handling Units
- B. Exhaust Fans (L-EF 3,5,6,7&8)
- C. Steam Condensate Pump (L-P-6)
- D. Chilled and Hot Water Pumps (L-P-1,2,3,4&5)
- E. Steam to Hot Water HX (L-HX-1&2)

- F. Air Outlets (8 types 526 Units – Test 10%)
- G. VAV with HW Coil (63 Units – Test 10%)
- H. CV Units with HW Coil (3 Units test 100%)
- I. Lighting Control System
- J. ATC System (test functionality as it has been modified by systems above)

## PART 2 - COMMISSIONING PROTOCOLS

### 2.01 PRE-FUNCTIONAL TEST SHEETS

- A. Pre-functional checklists are important to ensure that the equipment and systems are installed and started up as per the design documents and the manufacturer's start-up procedures. The CA develops the pre-functional test sheets (checklists) for each system and component to be commissioned. **The Contractor then fills out the pre-functional test sheets, and submits it for review.** The pre-functional test sheets and check-out by the CA is a parallel activity, and does not relieve the Contractors from their duties of verifying system installation and proper system start-up. The CA will share the test sheets with the Contractors for their review (if necessary). Once pre-functional test sheets are signed-off by the CA, functional performance testing may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout by the CA. In general, the pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
- B. Pre-functional checklists (or Testing Abstracts) are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word pre-functional refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist.

### 2.02 FUNCTIONAL PERFORMANCE VERIFICATION

- A. Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just individual components) under full, part and seasonal requirements. Systems are tested under various loads and control sequences, such as low cooling and heating loads, component failures, unoccupied modes, etc. The systems are run through all the control sequences of operation and components are verified to be responding as the design intent and documents. Functional performance verification shall include; testing all sequences of operations, verification of system capacity, generating simulated signals to simulate sensor values, conducting simulated conditions to tests all loads and verify system performance during all conditions of operation and verifying design intent. In addition, each system shall be tested through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Proper responses, such as power failures, freeze conditions, low-oil pressures, equipment failures, etc., shall also be tested. The CA develops the functional test sheets and procedures in sequential written form, coordinates the testing, conducts the testing and documents the testing. Each Contractor is required to supply personnel to assist during the functional performance testing where applicable.
- B. No system, equipment or component thereof shall be tested until the Contractor and the CM has certified, in writing, that the system, equipment and / or components are complete, have

been tested, adjusted and balanced and are ready for validating and performance testing. FPV is scheduled by the CA after the pre-functional testing requirements are complete and signed-off by the CM and the CA. FPV will not be conducted until a written notice of completion by the CM confirming that the system is ready for FPV. The air balancing and water balancing must be complete and the controls must be debugged prior to the performance verification.

- C. **Deferred Testing.** The Contractor shall be available to assist in seasonal testing, tests delayed until weather or other conditions, until building construction is completed, required building occupancy or loading, or other conditions are suitable for the demonstration of equipment or system's performance, as specified. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible. Deferred testing shall be executed, documented and deficiencies corrected as specified herein for functional performance testing. Any adjustments or corrections to the O&M manuals and "As built" documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

### 2.03 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

- A. The CA shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully. The testing form and any outstanding deficiencies shall be provided to the CM / Owner within two days of test completion. The CA shall review the Contractor's startup testing procedures and reports and shall submit either a non-compliance report or an approval form to the Contractor. The CA shall work with the Contractor and others as necessary, to correct and retest all cost deficiencies or uncompleted items. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report with a Statement of Correction on the original non-compliance report. When all requirements are satisfactorily completed, the CA shall recommend approval of the startup and pre-functional testing of each system and schedule the functional testing of the equipment or system.
- B. As functional performance testing progresses and a deficiency is identified, the CA shall discuss the issue with the executing Contractor and the commissioning team.
  - 1. When there is no dispute of the deficiency and the Contractor accepts responsibility for correcting it, the CA shall document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the contractor during the functional performance testing, at the discretion of the CA. Every effort shall be made or expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort.
  - 2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the non-compliance form, certifying that the equipment is ready to be retested, and return the form to the CM. The CM shall sign the form and submit to the CA. The CA shall schedule the retest of the equipment or system involved.
  - 3. If there is a dispute about an identified deficiency, the CA shall document the deficiency and the Contractor's response, and provide a copy to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. When the dispute resolution has been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and returns the form to the CA. The CA shall schedule the retest of the equipment or system involved. Final interpretive authority shall be the A/E. Final acceptance authority shall be the Owner.
- C. During the functional performance testing of multiple units of similar equipment, the CA shall test all of the equipment and components that are to be commissioned. If, under such a testing procedure, three or more, identical pieces of equipment (size alone does not constitute difference) fail to perform to the requirements of the Contract Documents (mechanically or substantively) due to manufacturing or installation defects not allowing it to meet its submitted

performance spec, all identical units may be considered unacceptable by the CA. In such case, the Contractor shall provide the CA with the following:

1. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CA within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor shall provide the CA and the A/E a signed and dated, written explanation of the problem, cause of failures, etc. and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solution shall not be for less than the specification requirements of the original installation.
3. When approved, two examples of the proposed solution shall be installed by the Contractor and the CA shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the CA shall recommend the acceptance or disapproval of the proposed solution to the Owner.
4. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair all identical items, at their expenses and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week of approval of the proposed solution.
5. Where 15% or more of a group of devices or components have failed, it shall be deemed that the entire group failed and will require retesting once the corrections have been made. The CM shall submit a letter to the CA that the corrections have been made by the Contractor and system can be retested.

D. Cost of Retesting

1. The cost for CA and/or Owner personnel to conduct the retesting of a functional performance testing requirements necessitated because a specific pre-functional or startup test item, reported to have been successfully completed, but found to be incomplete or faulty, shall be the responsibility of the Contractor.
2. For a deficiency identified during the functional testing, not related to any pre-functional checklist or start-up fault, the CA and Owner shall direct the retesting of the equipment once all deficiencies have been rectified. However, all costs for any subsequent retesting shall be the responsibility of the Contractor.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in backcharges to the responsible party.

## 2.04 OPERATION AND MAINTENANCE MANUALS

- A. Each Contractor shall submit operational and maintenance manuals to the CA, through the CM, prior to training. The CA reviews the O&M manuals, documentation and redline as-builts for systems that are commissioned to verify compliance with the Specifications. The CA provides written feedback on O&M manuals to the PM. Upon successful review of the corrections, the CA shall recommend approval and acceptance of these sections. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the Architect and Engineers responsibilities according to their contract.
- B. The O&M manuals shall be project specific, include all wiring diagrams and interconnections between trades. O&M manuals must meet at minimum the required checklist before acceptance for each component:
  1. Must be in a three-ring binder, with table of contents and tabbed sections.
  2. Building name, project title, project number, contractor name and contractor project number must appear on both the front cover and the spine of the binder.
  3. Provide a copy of the valve tag schedule at the front of the O&M manual
  4. Except for minor equipment, provide complete nameplate information at the front of the O&M. Include all data: serial numbers as well as complete motor nameplate data of corresponding equipment.



5. Provide a sheet at the beginning of the O&M listing equipment and the local supplier (with address and phone number) of that specific equipment.
6. For all equipment with warranties in excess of one-year (example VSD's), include extended warranty information in the front of the binder.
7. All information must be project specific. Do not provide generic vendor O&M manuals that cover multiple model numbers of equipment. Edit vendor O&M manuals to reflect exact equipment supplied. Cross out extraneous information not applicable to the specific equipment provided. Highlight applicable information for each piece of equipment installed.
8. For each piece of equipment, provide complete data relative to the make/model number, size, capacity data, manufacturer name and address, accessories included, etc. (i.e., provide complete information that would allow ordering the exact piece of equipment supplied). To accomplish this, include portions of the approved submittal for the piece of the equipment submitted. Do not include extraneous submittal information that does not facilitate actually ordering that piece of equipment.
9. If a piece of equipment contains multiple sub-assemblies provided by different manufacturers, include make/model number, size, capacity data, etc., to allow the ordering of the exact replacement. For example: for an air-handling unit, provide information on each coil, filter, damper, fan etc.
10. Job specific, as-built, wiring diagrams, piping diagrams, etc., must be supplied for all equipment. All external connections must be shown on these diagrams. Example #1: for VSD's, terminal strip numbers where external control signal is landed must be indicated. Example #2: A piece of equipment is supplied with controls that interface with the museum DDC system. Wiring diagram must be project specific and indicate interface with the existing DDC system.
11. For all pumps and fans, include performance curves, accessories and motor manufacturer information.
12. For all flow elements (pitot tubes, triple duty valves, circuit setters, etc.) provide all flow curves.
13. For all air-handling systems, include sound power data (normally this was included in the equipment submittal).
14. For all filters, clean and dirty filter drops must be provided.
15. For all electrical equipment sensor calibration and setup requirements must be detailed in the O&M manuals.
16. Provide a list of all manufacturer spare parts for major equipment installed.
17. Provide an approved copy of the air and water balancing reports in the O&M.
18. Provide an as-built copy of the project control drawings in the O&M, along with the installation and maintenance information on individual control components.
19. Provide a copy of the equipment vibration test report in the O&M.
20. For equipment requiring a factory start-up, a start-up report is required for the O&M.

## 2.05 TRAINING REQUIREMENTS

- A. Each Contractor is responsible for the training requirements. The CA shall be responsible for overseeing and approving the content of training the Owner's personnel for the equipment being commissioned. The CA will provide supplemental training if required by the Owner. Owner training and orientation on equipment and systems provided by the Contractor is accomplished in three general steps.
  1. Training Plan. After reviewing the specifications, and after interviewing facility staff, the Owner and CA document equipment for which training or orientation will be provided and designate responsible parties. This document lists, among other things, the type and number of trainees, rigor of training desired by the Owner, the primary responsible subcontractor, the trainer's company and columns for tracking training agendas. The Commissioning authority provides this form to the Contractor for reference.
  2. Training Syllabus & Agendas. For each piece of equipment or system for which training is provided, the contractor shall develop a Training Syllabus and Agenda for review and

approval by the Owner and CA. The syllabus and agenda includes information regarding the scope of training, intended audience, training materials, etc. The training shall include a plan for including in the training session contractors/trainers from different disciplines, when appropriate. For example, the controls contractor may be asked to provide brief training on controls in the same session with the mechanical training for equipment controlled by the building automation system. Approved syllabus and agendas shall be utilized and followed during each training session, with copies provided to each trainee.

3. Training Record. The contractor shall document the training session by means of a signed attendance sheet by both the trainer(s) and the attendees. The trainer checks off subjects covered on the Agenda. When the training is complete, the Contractor provides a copy of the training record, and the trainer's agenda to the Owner and CA. The Owner and CA review the training record and make final approval by signing it. The CA will, as appropriate, witness the training sessions. Where required by other sections of the specifications, the contractor shall video (DVD) the training session and provide to the CA and Owner the final and edited copy of the video for review and acceptance.

## 2.06 SCHEDULING REQUIREMENTS

- A. The As-Built drawings shall be updated to date and reviewed with the CA for approval no more than 45-days after all material is installed and in place.
- B. Testing and Start-ups schedules shall be kept up to date. Advise the CA and the Owner (in writing) with a minimum of 60 hours prior to commencement.
- C. Notify the CA and the Owner with a minimum of 2-weeks prior to the commencement of the TAB work for both the air and the hydronic systems. Follow requirements set forth in section 230800.
- D. Conduct a controls meeting as required in 230800 and 260800.

**END OF SECTION 019113**

## PART 1 GENERAL

## 1.01 RELATED SECTIONS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to Work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of portions of existing fire station, site improvements and other designated materials.
  - 2. Removing below-grade construction.
  - 3. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.
  - 4. Salvaging items for reuse.
  - 5. Vermin control during demolition and removal.
  - 6. Items indicated on the plans to be abandoned in place may be filled with flowable fill or other approved materials.
  - 7. Temporary barriers to restrict access, control dust, keep existing areas weather tight.
  - 8. Protection of remaining building components until replacement construction is complete.
  - 9. Identification of utilities both interior and exterior.
- B. Related Sections: Other specification Sections which directly relate to the work of this section include, but are not limited to, the following:
  - 1. Section 002100 - Notice to Bidders
  - 2. Section 015000 - Temporary Facilities & Controls
  - 3. Section 017700 - Closeout Procedures
  - 4. Section 220511 - Plumbing Demolition
  - 5. Section 260505 - Selective Demolition for Electrical

## 1.03 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- C. LEAD-SAFE working practices - an EPA term defining Contractor required procedures for containing work areas, minimizing dust and cleaning up when working with possible lead paint during construction projects.
- D. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- E. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- F. Remove and Reinstall: Detach items from existing construction, store, prepare them for reuse, and reinstall them where indicated.
- G. Remove and Salvage: Detach items for existing construction and store for Owner.
- H. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and store for Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

#### 1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of the General Construction Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### 1.05 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Submit to the Architect proposed abandonment and removal schedule and procedures. Include proposed methods for control of dust and noise.
- C. Photographs or videotape, sufficiently detailed of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the Work.

#### 1.06 QUALITY ASSURANCE

- A. Conduct demolition operations in a manner that will minimize interference with structure to remain and with public or private property in the vicinity of said operations.
- B. Pre-demolition Conference: Conduct conference at Project site with Architect. Review methods and procedures related to building demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be demolished.
  - 2. Review structural load limitations of existing structures.
  - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review and finalize protection requirements.
  - 5. Review procedures for protection of structure to remain, existing utilities, and existing exposed surfaces to remain.
- C. Review items to be salvaged and returned to Owner and/or reused in the construction process.

#### 1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable state and local codes for demolition of structures, safety of adjacent structures, dust control, runoff control, disposal and utility removal and cap offs.
- B. Obtain required permits from Regulatory and Governing Authorities.
- C. Notify affected utility companies before starting Work and comply with their requirements.
- D. Do not close or obstruct roadways, sidewalks or adjacent utilities without approval by authorities having jurisdiction and Architect.
- E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials. Hazardous and/or contaminated material removal are not the responsibility of this Contractor except where noted.
- F. Required hazardous/contaminated removals include the following:
  - 1. Removal and disposal of all refrigerant from air conditioning and other cooling equipment.

2. Removal and disposal of existing light fixture lamps (bulbs) and ballasts for light fixtures indicated to be removed and not re-used.
3. Removal and disposal of batteries that may be found in EXIT Lights, Emergency Lights, Fire Alarm Panels and/or other fixtures/equipment containing localized batteries for emergency operation.
4. Removal of existing oil/water separator(s), grease trap(s) (or tanks), holding tank(s), and septic tank(s) contents if tank removal is shown on Contract Drawings.
5. Removal and disposal in accordance with State and Federal Law of all thermostats and temperature gauges indicated to be removed or replaced. Recycle mercury thermostat and thermometers where State-specific laws require mercury recycling.
6. Removal of existing generator including batteries and engine oil.

#### 1.08 PROJECT CONDITIONS

- A. Fire Station has been vacated and its use discontinued.
- B. Assume all existing paint is lead base paint. Employ lead safe working practices when cutting, removing, and/or disturbing existing painted materials. EPA LEAD-SAFE working practices: <http://www.epa.gov/lead/pubs/renovation.htm>. See also OSHA 29 CFR Section 1926.62(a).
- C. Refer to the hazardous materials report for asbestos containing material locations
- D. Owner assumes no responsibility for buildings, structures, and site improvements to be selectively demolished.
  1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- E. Except where indicated to be salvaged as part of this Contract, on-site storage of removed items or materials is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- G. Promptly repair any damages caused by selective demolition work, at no additional cost to the Owner.

#### 1.09 LEAD PAINT WARNING:

- A. All contractors shall comply with the requirements of the OSHA construction standard for lead (29 CFR 1926.62) when disturbing painted surfaces at this facility.
- B. OSHA does not recognize any method of paint film evaluation as an acceptable means of determining the applicability of these regulations. It is the responsibility of contractors on this project to determine which of their activities are subject to the OSHA construction standard for lead and to implement any and all controls required by that standard at no additional cost to the Owner.
- C. All paint on existing structural steel, miscellaneous steel, any surface or other equipment at this facility shall be handled as "lead-based paint" unless proven otherwise. Any testing conducted to prove otherwise shall be at the expense of the party requiring such proof.

## PART 2 PRODUCTS

## 2.01 NOT APPLICABLE

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Provide, erect, and maintain temporary barriers and security devices as required.
- B. Protect existing materials, structure, driveways and walls which are not to be demolished.
- C. Prevent movement or settlement of remaining structure. Provide bracing and shoring, as required.
- D. Mark location of utilities.
- E. Verify that utilities have been disconnected and capped before starting demolition.
- F. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- G. Survey existing conditions and correlate with requirements indicated to determine extent of selective and complete demolition required. Record existing conditions by use of pre-construction photographs.
- H. Inventory and record the conditions of items to be removed and reinstalled and items to be removed and salvaged.

## 3.02 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  - 1. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
  - 2. Arrange to shut off indicated utilities with the applicable local utility provider.
  - 3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
  - 4. Cut off pipe or conduit a minimum of 24 inches below grade and well outside areas to be excavated. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction. Record location of any stubs still connected to active systems.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.
  - 2. Brace and stabilize any structure removed and stored for reinstallation to preserve stability and alignment of structure during its removal from its existing location, during transport of the structure from its existing location, and to and from all storage locations, both during storage and during transport to the structure's final location on the Work site.
  - 3. Engineer, design and install bracing, shoring and stabilization to comply with the following:
    - a. Loads imposed by movement.

- b. Environmental loads as defined in Chapter 16 of the International Building Code of New York State.
- c. Additional load and environmental effects of vibration.
- d. All other loads identified by an independent engineer.

### 3.03 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with structure to remain.
- B. Provide temporary enclosures and protection to maintain a weathertight building at all times.
- C. Cease operations immediately if adjacent structure appears to be in danger. Notify authority having jurisdiction and Architect immediately. Do not resume operations until directed.

### 3.04 PROTECTION

- A. Existing Facilities:
  - 1. Protect adjacent walkways, and other building facilities during demolition operations.
  - 2. Maintain required exits from existing buildings.
  - 3. Erect temporary barricades to prevent access from the occupied portions of the existing site to the construction work area. Maintain required means of egress. Adjust location and extent of temporary barricades as demolition/construction dictates.
  - 4. Remove temporary barricades and enclosures when no longer required. Restore any damage to existing surfaces caused by the installation and/or use of temporary barricades and enclosures. Leave area clean and neat.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
  - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
  - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
    - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction, and as indicated. Comply with requirements in Section 015000 - "Temporary Facilities and Controls".
  - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
  - 5. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

### 3.05 VERMIN CONTROL

- A. Employ a "Certified Commercial Applicator", certified by the New York State Department of Environmental Conservation, to exterminate rodents and vermin in the building and spaces to be demolished. Sequence extermination efforts with demolition activities to prevent

re-infestation of any portion of the building or spaces. During demolition activities, provide all necessary additional efforts to effectively watch for, capture, and exterminate any rodents and vermin that survive extermination efforts before such rodents and vermin can leave the site. Legally dispose of any carcasses and/or remains.

### 3.06 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  2. Provide 72 hours' notice of any operations likely to mar, stain, discolor, singe, or otherwise disturb adjoining exposed surfaces. Consult with Owner and Architect for best method of preservation of existing building surface to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  6. Dispose of demolished items off-site at an approved facility.
    - a. Dispose of existing light fixture lamps and ballasts in accordance with the Toxic Substances and Control Act (TSCA), New York State Department of Environmental Conservation (NYSDEC) and local authorities having jurisdiction.
    - b. Dispose/recycle thermostats and thermometers in accordance with State and Federal law.

### 3.07 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Demolition under this Project does not include any removal or relocation of asbestos containing materials or removal of any buried petroleum tanks. Identification and demolition of such materials/items will be completed prior to commencement of work under this Project.
    - a. Hazardous Materials: If materials suspected of containing hazardous materials other than those identified to be removed are encountered, do not disturb; immediately notify Owner.
  2. Disconnect, remove, and/or end cap and identify designated utilities within demolition areas as indicated on the drawings.
  3. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of this Section.
  4. Remove demolished materials from site and dispose of legally.
  5. Do not burn or bury materials on site. Remove demolished materials as Work progresses. Leave building and site in clean condition.
  6. Demolish in an orderly and careful manner. Protect existing supporting structural members.
  7. At or adjacent to existing construction to remain, neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools



- designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
8. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  9. Maintain fire watch during and for at least 48 hours after flame cutting operations as required by applicable local and state regulations.
  10. Maintain adequate ventilation when using cutting torches.
  11. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  12. Remove air-conditioning equipment without releasing refrigerants. Dispose of any refrigerant materials in accordance with authorities having jurisdiction. Refrigerant materials to be handled by a qualified and trained refrigerant technician.
    - a. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations and other authorities having jurisdiction regulations. Include name and address of technician and date(s) refrigerant was recovered.
  13. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
  2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

### 3.08 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled decent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
  2. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction where such construction is two or more feet below finished grade.
1. Demolish all such below-grade construction that lies within the footprint indicated for new construction or that extends up to 5 feet outside the footprint indicated for new construction.
  2. Abandon all such below-grade construction lying over 5 feet outside the footprint indicated for new construction.
  3. Remove below-grade construction, including basements, foundation walls, and footings, to depths indicated.
  4. Septic and/or holding tanks shall be pumped out by a licensed, professional septic system contractor. Metal tanks shall be removed and disposed of in accordance with authorities

having jurisdiction. Backfill tank excavations with select granular fill, compacted in 8" lifts. Concrete tanks, distribution boxes and drywells if outside the new structure footprint and pavement areas may be crushed (after pumping) and compacted in place or filled with lean concrete unless prohibited by local codes. Concrete septic tanks, drywells and distribution boxes within the new structure footprint and/or pavement areas shall be removed, backfilled in 8" lifts and compacted with select granular fill.

### 3.09 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.
- B. Promptly repair damage to adjacent structure caused by demolition operations.

### 3.10 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth, rolled surface, free from irregular surface changes. Areas of demolished construction shall not pond water and shall be graded to sheet surface water away from areas of new proposed construction. Provide a smooth transition between adjacent existing grades and new grade.

### 3.11 EXTERIOR BUILDING ENVELOPE RESTORATION

- A. Promptly seal all openings in the exterior building envelope resulting from selective demolition removals.
  - 1. If openings will be re-used, temporary sealing may be employed.
  - 2. All permanent sealing methods for each different type of condition shall be submitted to the Architect for approval, if not detailed on the Contract Drawings.
  - 3. Thru penetrations must be sealed from both sides of the penetration.
  - 4. Permanent sealing shall be finished to match existing finishes both interior and exterior for thru wall or thru roof penetrations, and finished to match on penetration side if not thru wall (i.e. fastener holes, etc.).
  - 5. Provide decking to match existing in roof openings needing to be partially or fully in-filled. Repair decking shall overlap existing decking by 6 inches in all directions and be securely fastened to existing decking or structure. Openings greater than 144 square inches shall require additional structural support equal to typical roof deck opening reinforcing or as detailed on the Contract Drawings. Match roof insulation type and thickness if existing roof insulation is scheduled to remain.

**END OF SECTION 024119**

## PART 1 - GENERAL

## 1.01 SCOPE OF WORK

- A. Broad Scope: Asbestos containing materials (ACM) have been identified at the project site. Samples of various suspect materials have been collected and analyzed; additional samples may be required as existing materials are removed or revealed during the course of work. The scope of work and procedures outlined herein shall be followed by a New York State Department of Labor (NYS DOL) certified asbestos abatement contractor.
- B. Related Sections:
  - 1. Section 022600 - HAZARDOUS MATERIALS ASSESSMENT.
- C. SCOPE OF WORK
  - 1. Removal of the items described in the asbestos survey as positive for asbestos, in accordance with NYSDOL Industrial Code Rule (ICR) 56:
  - 2. Asbestos Containing materials must be removed only by a New York State Department of Labor (NYS DOL) licensed asbestos abatement contractor (herein referred to as the "Contractor").
  - 3. The Contractor shall be aware of all conditions of the Project and is responsible for field verifying quantities and locations of all ACM to be removed from the building prior to submission of any bid. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work. The quantities presented in this Specification are approximate and should not be used solely as the basis for any bid. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested for asbestos content or assumed positive for asbestos content, and removed in accordance with the procedures herein. Any discovery of new ACM shall not delay the progress of the Work. Payment for any additional work shall be considered on a case-by-case basis by the Engineer and Owner.
  - 4. All Work shall be performed in strict accordance with the Contract Documents and all applicable codes, rules, and regulations. Where conflicts occur between the Contract Documents and applicable codes, rules, and regulations, the more stringent shall apply.
  - 5. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by the Owner's representative. The Contractor shall be responsible for monitoring his own construction safety work practices for compliance with the OSHA regulations.

## 1.02 SPECIAL JOB CONDITIONS

- A. Any special job conditions, including variances to be obtained by the Contractor, are described herein.
  - 1. A Site Specific Variance is anticipated for the asbestos abatement work as described in Section 1.01A to alleviate the requirement of full containment.
  - 2. The contractor shall be responsible for obtaining any site specific variances.
  - 3. No chemicals shall be utilized during the removal of mastic.

## 1.03 CODES, PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56, 40 CFR 61, and 29 CFR 1926, as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.

- C. State Licenses: The Contractor must maintain current licenses pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.
1. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in, or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Industrial Code Rule 56.
  2. The Contractor shall comply fully with the variances secured from regulatory agencies in the performance of the Work. The Contractor shall also be responsible for paying and complying with any additional variances. Should the Contractor choose to apply for any variance, approval from the Engineer is first required. In the event that the Contractor chooses to use more than one NYS Applicable Variance in the same Work Area simultaneously, the Contractor is responsible for complying with all conditions of each variance and any NYS DOL interpretations concerning the use of these variances together.
- D. Agency Notifications: The Contractor shall prepare written notification to EPA Region 2, and to the NYSDOL at least 10 days prior to commencement of Work, when applicable. The Contractor shall be responsible for use and payment of any notifications required for performance of the Work.
- E. It is the sole responsibility of the Contractor to determine what, if any patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He/She shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, and Construction Manager harmless from loss, including attorney's fees, on account thereof.
- F. Before commencement of Work, the Contractor shall review and adhere to the Contract Documents. Failure to adhere to the Contract Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

#### 1.04 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
  2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
  3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
  4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
  5. 29 CFR 1926, "Construction Industry" (OSHA)
  6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
  7. 29 CFR 1926.2, "Variances from safety and health standards" (OSHA)
  8. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
  9. 29 CFR 1926.1200 "Confined Spaces in Construction" (OSHA)
  10. 40 CFR 61, Subpart A, "General Provisions" (EPA)
  11. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
  12. 49 CFR 171-172, Transportation Standards (DOT)
  13. 40 CFR Part 763, "Asbestos Hazard Emergency Response Act" (AHERA)
- C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
  2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)

3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
  4. New York State Department of Health (NYSDOH) Training Requirements
- D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
  2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
  3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
  4. EPA 530-SW-85-007, Asbestos Waste Management Guidance

#### 1.05 AUTHORITY TO STOP WORK

- A. The Owner shall have the authority to stop the abatement work at any time a determination is made that conditions are not within Specification and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of the Owner. Standby time to resolve the problems shall be at the contractor's expense.

#### 1.06 SUBMITTALS

- A. Pre-contract Submittals. After bids are opened, the apparent low bidder shall submit the following documentation, in accordance with the project deadlines outlined in the Contract Documents. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.
1. Contractor license issued by New York State Department of Labor.
  2. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, and air monitoring firm's name, contact persons, address, and phone number.
  3. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
  4. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
    - a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
    - b. Any litigation or arbitration proceedings arising out of performance on past Projects.
    - c. Any liquidated damages assessed within the last 2 years.
  5. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.
- B. Pre-Work Submittals. The Contractor shall submit 3 copies of the documents listed below, in accordance with the project deadlines outlined in the Contract Documents:
1. Progress Schedule:
    - a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
    - b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
  2. Notifications: As required by Federal, State and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
  3. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
  4. Abatement Work Plan: Provide plans which clearly indicate the following:
    - a. All Work Areas/containments numbered sequentially.

- b. Locations and types of all decontamination enclosures.
  - c. Entrances and exits to the Work Areas/containments.
  - d. Type of abatement activity/technique for each Work Area/containment.
  - e. Number and location of negative air units and exhaust.
  - f. Proposed location and construction of storage facilities and field office.
  - g. Location of water and electrical connections to building services.
  - 5. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
  - 6. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (encapsulant, surfactant, mastic remover, etc.).
  - 7. Laboratory: Submit the NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
- C. Project Close-out Submittal. Submit the following at the closeout of the Project:
- 1. Copies of all waste disposal manifests, seals, and disposal logs.
  - 2. OSHA compliance air monitoring records conducted during the Work.
  - 3. Daily progress log.
  - 4. Entry and exit log.
  - 5. A list of each Worker used in the performance of the Project, including name, social security number, and NYS DOL certification number.

#### 1.07 HEALTH & SAFETY

- A. Worker Protection: The Contractor shall comply with OSHA and provide and maintain all safety measures necessary to properly protect all individuals that enter the work area.
- B. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Contractor shall immediately act in such a manner to prevent such threatened loss or injury.
- C. Fire Protection, And Emergency Egress: The Contractor shall be responsible to the security and safeguarding of all areas turned over by the Owner to the Contractor. The Contractor shall designate to his workers and other building occupants the means of egress in case of emergency.
- D. The Contractor shall establish emergency and fire exits from the work area. First aid kit, two (2) full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.
- E. Contractor shall provide fire watch and logbook throughout the entire term of the project, to protect against fire and unauthorized entry into and around the work area. Any intrusion or incident shall be documented in the logbook. Fire watch personnel shall be present during off-hours shift such as night shift, weekends and holidays when abatement work is not in progress. Fire watch shall be a certified asbestos handler by NYSDOL.

#### 1.08 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, and in accordance with the deadlines outlined in the Contract Documents, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Engineer, if requested.
- B. Agenda for this conference shall include but not necessarily be limited to:
  - 1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
  - 2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
  - 3. Owner & Engineer's duties, functions, and authority.
  - 4. Contractor's Work procedures including:

- a. Methods of job site preparation and removal methods.
  - b. Respiratory protection.
  - c. Disposal procedures.
  - d. Cleanup procedures.
  - e. Fire exits and emergency procedures.
  5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
  6. Temporary utilities.
  7. Handling of furniture and other moveable objects.
  8. Storage of removed asbestos containing materials.
  9. Waste disposal requirements and procedures.
- C. In conjunction with the conference, if requested, the Contractor shall accompany the Owner and/or Engineer on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

#### 1.09 PROJECT MONITORING, AIR SAMPLING, AND INSPECTIONS

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) or Engineer who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement period.
- B. The Contractor is required to ensure cooperation of its personnel with the Consultant/Engineer for the air sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant/Engineer during the course of the Project.
- C. The Consultant/Engineer shall provide the following administrative services:
1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
  2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
  3. Review and approve the Contractor's OSHA compliance testing laboratory.
- D. The Consultant/Engineer shall staff the Project with a NYSDOL-trained and certified Project Monitor to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site.
  2. The APM has the authority to direct the actions of the Contractor verbally and in writing if the Contractor is not performing in compliance with the Project Documents and all regulations. Such authority does not in any way diminish the Contractor's sole responsibility to perform all Work in accordance with the Contract Documents and regulations. However, only the Owner shall have the authority to Stop Work when gross work practice deficiencies or unsafe practices are reported by the APM or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level, whichever is greater.
    - a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
    - b. Standby time required to resolve the situation shall be at the Contractor's expense.
  3. The APM shall provide the following services:
    - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
    - b. Provide abatement Project air sampling as required by applicable regulations (NYS, AHERA). Sampling will include pre-abatement (backgrounds), work area preparation, during abatement and clearance sampling.

- c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
  - d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
  - e. Monitor, verify, and document all waste load-out operations.
  - f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
- 4. Inspections shall be conducted at various milestones as Work progresses by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of work to the next by the Contractor shall be permitted only after visual inspection and verbal approval by the APM.
- E. The Consultant/Engineer shall provide abatement project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include background, pre-abatement, during-abatement and clearance sampling.
  - 1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) using NIOSH Method 7400. Results shall be available within 24 hours of completion of sampling.
  - 2. If the air sampling during abatement reveals airborne fiber levels at or above 0.01 fibers/cc or the background level (whichever is greater) outside the Work Area, then the Owner shall issue an immediate Stop Work order. The Contractor shall then inspect the barriers for leakage and HEPA vacuum and/or wet clean the surface outside the Work Area. The Contractor shall bear the burden of any and all costs incurred by this delay.
  - 3. Final air clearance sampling will be conducted by Transmission Electron Microscopy (TEM) in accordance with 40 CFR Part 763 (AHERA), as applicable.

#### 1.10 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being utilized (OSHA Monitoring).
- B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.
- C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory.

#### 1.11 WORK SUPERVISION

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
  - 1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
  - 2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
  - 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. If the Project Supervisor is not on-site, all Work shall be stopped. The Project Supervisor shall remain on-site whenever asbestos removal is being performed. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Engineer.



- C. The Project Supervisor shall maintain the Project Log Book required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log required by section 4.04 of the specifications.
- D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

#### 1.12 DELIVERY AND STORAGE

- A. Deliver non-contaminated materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
  - 1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
  - 2. Protect materials from unintended contamination.
- C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

#### 1.13 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the asbestos Work Areas.
- B. Provide temporary 120-208 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
  - 1. Where available, obtain from Owner's existing electrical system. Otherwise provide power from other sources (i.e. generator).
  - 2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
  - 3. Provide adequate "weatherproof" receptacles, to incorporate use by the APM for air sampling equipment.
  - 4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.
- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
  - 1. The entire Work Area shall be kept illuminated at all times work is in progress.
  - 2. Provide lighting adequate for the purposes of performing required inspections.
- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

### PART 2 - PRODUCTS

#### 2.01 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not

be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

## 2.02 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall be imprinted with U.S. Department of Transportation required markings.
- B. If the asbestos waste has the potential to damage or puncture the disposal bags, burlap sacks shall be utilized as a liner inside the polyethylene disposal bags to prevent puncture or damage to the disposal bags. In addition, 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight may also be used. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated in accordance with 40 CFR Part 61 NESHAPS.
- D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

## 2.03 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

## 2.04 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be equipped with HEPA filtered local exhaust ventilation.

# PART 3 - EXECUTION

## 3.01 GENERAL REQUIREMENTS

- A. Should the area beyond the Work Area(s) become contaminated with asbestos containing materials or elevated fiber levels, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for asbestos removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.
- B. NYS DOL certificates shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.
- C. Perform all asbestos removal Work using wet removal procedures. Dry removal procedures are not permitted.
- D. The following documents shall be posted at the site at an easily accessible location:
  - 1. Company Asbestos Abatement license.

2. Worker's asbestos handling certificates (copies are acceptable provided Workers have original certificates in their possession).
  3. Project specifications.
  4. Project drawings.
  5. Notifications and variances.
  6. Applicable regulations.
  7. Material Safety Data Sheets.
  8. Abatement Work plan.
  9. List of emergency telephone numbers.
  10. Waste Disposal Log.
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

### 3.02 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Full (five room) Decontamination Facility: The Contractor shall provide a full decontamination enclosure system for large asbestos projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).
- B. Remote Decontamination Facility: The Contractor shall provide a remote personnel decontamination enclosure system for small asbestos projects, asbestos projects that utilize multiple tents, and exterior asbestos roof projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).
- C. Decontamination Enclosure System Utilities: Lighting, heat, and electricity shall be provided as necessary by the Contractor.

### 3.03 WASTE DECONTAMINATION ENCLOSURE

- A. Waste/Equipment Decontamination Enclosure System: This system is located adjacent to the work area and personnel decontamination system. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. A remote decontamination unit may be used that complies with subpart 56-9 of NYS Industrial Code Rule 56 of Title 12, section 30 of the Labor Law. This remote enclosure system must be on the property and stationary, within 50 feet of the building.
- B. Where only one egress from the Work Area exists, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.
- C. The waste wash room water shall be drained, collected, and filtered as specified in ICR 56.
- D. In small asbestos projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

### 3.04 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Personnel Entrance and Decontamination Procedures for Gross Removal Operations utilizing full decontamination facility, the following entry/exit procedures shall be used for gross removal using full containment:
1. All workers and authorized visitors shall enter the work area through the worker decontamination enclosure system.

2. All individuals who enter the work area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each work area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity.
  3. Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator (with new filters, if appropriate) and clean protective clothing before entering the work area through the shower room and equipment room.
  4. Each worker or authorized visitor shall, each time he/she leaves the work area: remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.
  5. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the work area is not permitted outside the work area.
- B. Personnel Entrance and Decontamination Procedures for Removal Operations utilizing remote decontamination facility: The following entry/exit procedures shall be used for removal work areas.
1. All individuals who enter the Work Area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each Work Area, and worker respiratory protection employed. The job supervisor shall be responsible for the maintenance of the log during the abatement activity.
  2. Each worker shall remove street clothes in the clean room; wear two disposable suits, including gloves, hoods and non-skid footwear; and put on a clean respirator (with new filters) before entering the work area.
  3. Each worker shall, before leaving the work area or tent, shall clean the outside of the respirators and outer protective clothing by wet cleaning and/or HEPA vacuuming. The outer disposable suit shall be removed in the work area and the worker shall then proceed to the shower room. The inner disposable suit and respirator shall be wet wiped and HEPA vacuumed thoroughly before removing and prior to aggressive shower.
  4. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately.

### 3.05 WORK AREA PREPARATION

- A. Work Area preparation shall be performed in accordance with ICR 56, the Contract Documents and the approved Asbestos Work Plan.
- B. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.
- C. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil polyethylene or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation, he/she shall be responsible for reinsulation, if reinsulation of removed ACM is part of the Contract or Project.

- D. Emergency exits. Emergency exits and routes shall be established and clearly marked with florescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.
- E. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.
- F. If, required, suspended ceiling tiles shall only be removed after Work Area preparation is complete. Non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.
- G. For tent enclosures: the Contractor shall use negative pressure ventilation equipment to continuously exhaust the enclosed area. A minimum of two (2) volume changes per hour is required. All required air monitoring must be successfully completed before the tent/barrier is collapsed.

### 3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

- A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement.
- B. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.
- C. At no time will the unit exhaust indoors, within 50 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building.
- D. The Contractor shall provide either a manometer or a photohelic style negative air pressure gauge with chart recorder to measure and record negative pressure differential across the Work Area barriers without interruption 24 hours per day as directed by the Environmental Consultant.
- E. There shall be at least a 12-hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers. Unless otherwise specified in the variance(s) utilized by the contractor.

### 3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

- A. Asbestos-containing materials shall be removed in accordance with ICR 56, the Contract Documents and the approved Asbestos Work Plan.
- B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while ACM is being removed.
- D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment

and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.

- E. Power or pressure washers will not be allowed to be used for asbestos removal or clean-up procedures.

### 3.08 ACM WASTE CONTAINERIZING, DECONTAMINATION AND LOAD OUT PROCEDURES

- A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171, 172, and 173, and EPA Standard 40 CFR Part 61 and the requirements as herein specified. Materials to be transported through a non-Work area building space shall be placed in hard wall shipping containers for handling.
- B. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- C. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- D. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

### 3.09 WORK AREA CLEANING PROCEDURES

- A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, decontamination procedures shall be followed as specified in ICR 56, unless otherwise stated in the variance(s) utilized by the Contractor.
- B. Following each decontamination procedure (i.e., first, second, and third cleanings) the APM shall inspect the Work Area for effectiveness of the cleanings. If necessary, additional cleaning shall be performed by the Contractor as directed by the APM.
- C. As a result of any air sampling results that indicate high fiber levels, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

### 3.10 TENT ENCLOSURES

- A. Tent enclosures may only be used in areas specifically permitted by NYS Department of Labor Code Rule 56 or a Project specific variance issued by the NYS Department of Labor.
- B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.
- D. During removal activity, a HEPA vacuum or small capacity negative pressure filtration unit shall be used to provide a negative air pressure inside the tent. A minimum of six air changes per hour is required.
- E. Workers shall wear two disposable suits for all phases of Work. Workers exiting the tent shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another tent.

- F. ACM removal shall follow procedures defined in Section 3.07.
- G. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double-bagging. The bags or containers shall then be transported to the decontamination enclosure and then bagged for a third time and transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.
- H. The APM shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.

### 3.11 GLOVEBAG REMOVAL

- A. Glovebag removals may only be used as specifically permitted by NYS Department of Labor Code Rule 56, Applicable Variance 108 (AV 108) Glovebag Operations, or a Project specific variance issued by the NYS Department of Labor. Glovebags may only be used on piping.
- B. As specified in applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications. Removal and disposals must also be conducted in conformance with all Project variance conditions.
- C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- D. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.
- E. The glovebags shall be smoke tested by the APM before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.
- F. After glovebag removals are complete, tent decontamination procedures shall be followed.

### 3.12 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

- A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.
- B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.
  - 1. Finishes unable to be restored shall be replaced under this Contract.
  - 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.
- C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where re-insulation is part of the required work.

### 3.13 ASBESTOS WASTE

- A. Applicable Regulations: All asbestos waste shall be stored, transported and disposed of in accordance with the following regulations as a minimum:
1. NYS DEC 6 NYCRRNYRCC part 360 and 364.
  2. US EPA NESHAPS 40 CFR 61.
  3. US EPA Asbestos Waste Management Guidance EPA/530-SW85.
- B. Waste Storage Containers.
1. As work progresses, remove sealed and labeled bags of ACM from the Work area and place in a lockable trailer, dumpster, or other container approved for storage or transport of asbestos waste. Open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).
  2. The container interior shall be plasticized and sealed with a minimum of two (2) layers of 6 mil polyethylene.
  3. While on-site, the container shall be labeled with EPA Danger signage:

**DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD**

4. The danger sign legend, text size, style and arrangement shall conform to the requirements of EPA Standard 40 CFR Part 61.149 (d) (1).
5. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.
6. Once the container is loaded at the site, the door(s) will be locked at all times.
7. Before the container is removed from the Project Site for transportation to the Disposal Site, the door(s) shall be locked. The locks shall be removed at the Disposal Site by the operator of the Disposal Facility.
8. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

### 3.14 DISPOSAL AND TRANSPORTATION OF ASBESTOS-CONTAMINATED WASTES

- A. Sealed and labeled disposal bags or waste wrapped in two layers of plastic sheeting sealed airtight shall be used to transport asbestos-contaminated waste to the landfill. Procedures for hauling and disposal shall comply with 40 CFR, Part 61, 49 CFR, Part 171 and 172, and other applicable state, regional, and local government regulations.
1. An asbestos waste shipment record or waste manifest shall accompany asbestos waste, which is transported to a disposal site.
  2. The waste manifest shall be completed by the Contractor.
  3. The waste manifest shall have the appropriate signatures of the APM, the Contractor, and the Hauler representatives prior to any waste being removed from the site.
  4. Copies of the completed waste manifest shall be retained by APM and the Contractor and shall remain on site for inspection. The Contractor shall forward originals of the waste manifest, which include final sign-off by the disposal facility, to Consultant/Engineer within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

### 3.15 DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.



- B. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.
- C. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site without unauthorized stops.

**END OF SECTION 028200**

## PART 1 - GENERAL

## 1.01 SCOPE OF WORK

- A. Related Sections:
  - 1. Section 022600 - HAZARDOUS MATERIALS ASSESSMENT.
- B. This lead-based paint and material removal project will consist of the localized removal of loose and/or damaged lead based paint in the areas indicated in the report attached herewith.
- C. The work shall include, but not be limited to removal and disposal of the following:
  - 1. All positive lead containing materials greater than regulatory level of 1.0 described in the lead paint inspection report attached within Specification Section 022600 - HAZARDOUS MATERIALS ASSESSMENT.
- D. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.
- E. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.
- F. For US EPA and/or HUD Target Housing or Child Occupied Facilities with lead levels exceeding EPA thresholds, comply with Specification Section 028305 - US EPA RRP LEAD PROTOCOL in accordance with 40 CFR 745.
- G. Refer to SSPC C3/5 requirements, when applicable, when removing lead on commercial buildings and superstructures including on all steel where impact is not incidental and activities include but are not limited to; abrasive blasting, water jetting, power tool usage, and other large dust producing remedial activities.

## 1.02 PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. The Contractor must maintain current licenses pursuant to New York State Department of Labor, Department of Environmental Conservation and Environmental Protection Agency for all Work related to this Project, including the removal, handling, transport, and disposal of lead containing materials.
- C. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any lead Project have prior experience on similar projects. If in the course of the project there should be materials or surfaces that contain asbestos, the contractor and all workers must be certified by the NYS Department of Labor as handlers and contractor/supervisors. It is then the responsibility of the contractor to also follow the asbestos specification for this project.
- D. It is the sole responsibility of the Contractor to determine what, if any, patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, Environmental Consultant, and Construction Manager harmless from loss, including attorney's fees, on account thereof.

- E. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

### 1.03 SUBMITTALS

- A. Pre-contract Submittals: Within 3 days after bids are opened, the three apparent low bidders shall submit the following documentation. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.
  - 1. Contractor certifications issued by the Environmental Protection Agency.
  - 2. The number of years engaged in lead-based paint renovation and remodeling projections.
  - 3. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, contact persons, address, and phone number.
  - 4. A list of owned equipment available to be used in the performance of the Project.
  - 5. An outline of the Worker training course and medical surveillance program conducted by the Contractor.
  - 6. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
  - 7. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
    - a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous lead contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
    - b. Any Stop Work Orders issued on Projects within the past 2 years.
    - c. Any litigation or arbitration proceedings arising out of performance on past Projects.
    - d. Any liquidated damages assessed within the last 2 years.
  - 8. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.
- B. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below:
  - 1. Progress Schedule:
    - a. Show the complete sequence of lead related activities and the sequencing of Work within each building section.
    - b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area or phase.
    - c. Show projected percentage of completion for each item, as of the first day of each month.
    - d. Show final inspection dates.
  - 2. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
  - 3. Lead Activities Work Plan: Provide plans which clearly indicate the following:
    - a. All Work Areas/containment's numbered sequentially.
    - b. Locations and types of all decontamination enclosures.
    - c. Entrances and exits to the Work Areas/containment's.
    - d. Type of lead related activity/technique for each Work Area/containment.
    - e. Proposed location and construction of storage facilities and field office.
    - f. Location of water and electrical connections to building services.
  - 4. Equipment: Submit manufacturer's data sheets/product descriptions of all equipment and products including HEPA vacuums, respirators, protective clothing, chemicals, etc. identified in this specification.

5. Samples: Submit samples of warning notices to be posted, replacement materials, etc.
  6. Worker Training, Medical Surveillance, and Certification:
    - a. The Contractor shall submit a list of persons to be employed for the Project.
    - b. Present evidence that Workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926. 62.
    - c. Submit documentation that Workers have been fit tested specifically for respirators used on the Project.
    - d. Submit copies of Proof of Lead Renovation Remolding certification for each person employed in the disturbance of lead.
  7. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
  8. Material List: A complete materials list of all items proposed to be furnished and used under this Contract.
  9. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
  10. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (paint stripper, surfactant, etc.)
  11. Project Supervisor: Resume of the proposed Project Supervisor.
  12. Rental Notifications: Notices sent to rental suppliers informing them of the nature of the Work that the Contractor intends to use the equipment for.
  13. Worker's Acknowledgments: Statements signed by each employee that the employee has received training in the proper handling of lead containing paint; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.
  14. Laboratory: Submit the documentation that the laboratory performing the OSHA personnel air samples is recognized as an Environmental Protection Agency National Lead Laboratory Accredited Program (NLLAP) accredited laboratory.
  15. HUD Title X: "Guidelines for the Evaluation and Control of Lead Based Paint."
- C. Project Close-out Submittals: Submit the following at the closeout of the Project:
1. Copies of all waste disposal manifests, seals, and disposal logs.
  2. OSHA compliance air monitoring records conducted during the Work.
  3. Daily progress log.
  4. Entry and exit log.
  5. A list of all EPA Certified Workers used in the performance of the Project, including name, social security number.
  6. Required Employee Statements including Medical Examination Statement, Worker's Acknowledgment Statement, and Employee Training Statement.

#### 1.04 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.
- B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
  2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
  3. Environmental Consultant's duties, functions, and authority.
  4. Contractor's Work procedures including:
    - a. Methods of job site preparation and removal methods.
    - b. Respiratory protection.
    - c. Disposal procedures.
    - d. Cleanup procedures.
    - e. Fire exits and emergency procedures.

5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
  6. Temporary utilities.
  7. Handling of furniture and other moveable objects.
  8. Storage of removed lead containing paint.
  9. Waste disposal requirements and procedures.
- C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

#### 1.05 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
1. 29 CFR 1910, Occupational Safety and Health Standards
  2. 29 CFR 1926, Safety and Health Regulations for Construction
  3. 40 CFR 148, Hazardous Waste Injection Restrictions
  4. 40 CFR 260, Hazardous Waste Management System: General
  5. 40 CFR 261, Identification and Listing of Hazardous Waste
  6. 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
  7. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
  8. 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
  9. 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
  10. 40 CFR 268, Land Disposal Restrictions
  11. 40 CFR 745, Lead; Identification of Dangerous Levels of Lead; Proposed Rule
  12. 49 CFR 172, Hazardous Material Table, Special Provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements
  13. 49 CFR 178, Specifications for Packaging
  14. HUD 0005646, (1990; Rev May 1991) Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing
- C. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
  2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
  3. UL 586, (1990) High-Efficiency, Particulate, Air Filter Units
  4. NIOSH OSHA Booklet 3142, Lead in Construction
  5. NFPA 701, (1989) Methods of Fire Test for Flame-Resistant Textiles and Films
  6. EM 385-1-1, (1992) U.S. Army Corps of Engineers Safety and Health Requirements Manual

#### 1.06 NOTICES

- A. The Contractor shall post and/or provide notification to building occupants 10 days prior to beginning lead activities. The posting shall include the following information:
1. The locations of the lead Renovation Remolding Project.
  2. The amounts and types of materials being removed and/or disturbed.
  3. The commencement and completion dates of the Project.
  4. The name, address, and certification of the Lead Contractor.

5. The name and address of the Environmental Consultant and laboratory.

#### 1.07 PROJECT MONITORING AND WIPE SAMPLING

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the lead-based paint Project and provide direction as required throughout the entire lead period.
- B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the wipe sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant during the course of the Project.
- C. The Consultant shall provide the following administrative services:
  1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
  2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
  3. Review and approve the Contractor's OSHA compliance testing laboratory.
- D. The Consultant shall staff the Project with a trained person(s) to act on the Owner's behalf at the job site. At a minimum the trained person(s) shall be certified as a lead inspector or risk assessor. This individual shall be designated as the Lead Project Monitor (LPM).
  1. The LPM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the LPM is on-site.
  2. The LPM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The LPM shall have the authority to Stop Work when gross work practice deficiencies or unsafe practices are observed.
    - a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
    - b. Standby time required to resolve the situation shall be at the Contractor's expense.
  3. The LPM shall provide the following services:
    - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
    - b. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
    - c. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
    - d. Monitor, verify, and document all waste load-out operations.
    - e. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
  4. The following minimum inspections shall be conducted by the LPM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of work to the next by the Contractor is only permitted with the approval of the LPM.
    - a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
    - b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any lead containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
    - c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the LPM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.

- d. Visual Clearance Inspection: The purpose of this inspection is to verify the Contractor's certification that all materials have been removed from the Work Area and the absence of all visible accumulations of debris in the Work Area.
- e. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that work has been completed as contracted and the existing condition of the area prior to its release to the Owner.
- 5. The LPM shall perform lead wipe (lead-dust clearance) sampling as follows:
  - a. Wipe samples shall be collected from one sill surface and floor area surface where doors have been removed following the lead contractor's final cleaning of the work area. Lead wipe samples shall be analyzed by a NLLAP laboratory. Results shall be available within 24 hours of completing sampling.
- 6. The LPM shall perform a pilot air monitoring project as follows:
  - a. Air samples shall be collected during the first phase of the lead project to determine if lead removal methods are generating airborne lead dust at concentrations exceeding regulatory guideline for locations exterior the Work Area. At least one air sample will be collected at the entrance to the Work Area and at critical barriers.
  - b. Should it be established that airborne lead-dust concentrations, exterior to the work area, are within the applicable guidelines, no further air monitoring will be performed. Should airborne lead-dust concentrations, exterior the work area, be determined to exceed the applicable guideline concentration, additional engineering controls will be implemented and the pilot project repeated. Once effective engineering controls have been established and implemented, no further air monitoring will be performed.
  - c. Lead air samples shall be analyzed by a NLLAP laboratory. Results shall be available within 24 hours of completing sampling.

#### 1.08 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.62, the Contractor shall be required to perform personal air monitoring to determine that appropriate respiratory protection is being utilized.
- B. The Contractor's laboratory analysis of air samples shall be conducted by NLLAP approved laboratory, subject to approval of the Environmental Consultant.
- C. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days.

#### 1.09 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
  - 1. The Project Supervisor shall hold Lead certification for the renovation & remodeling of lead-based paint.
  - 2. The Project Supervisor shall have a minimum of one-year experience as a supervisor.
  - 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. Prior to the commencement of Work, the Contractor shall submit the proposed Project Supervisor's resume to the Owner and Environmental Consultant for approval.
- C. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Environmental Consultant.

- D. The Project Supervisor shall maintain the Project Log Book required by section 2.03 of the specifications and a Waste Disposal Log.
- E. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Lead Project Monitor.

#### 1.10 MEDICAL REQUIREMENTS

- A. Employers must make available medical examinations to all employees covered under the medical surveillance program. Medical exams must be performed:
  - 1. Medical Surveillance should have undergone an initial medical surveillance examination
  - 2. At least annually when tests within the preceding 12 months indicated a blood lead level at or above 40 µg/dl;
  - 3. Prior assignment for each employee for the first time to an area in which lead concentrations are above the action level;
  - 4. As soon as possible when employee has developed signs or symptoms of lead exposure;
  - 5. For employees medically removed from work area; and
  - 6. For employees as final medical determination.
- B. The medical exam consists of the following:
  - 1. A detailed work and medical history with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematological, renal, cardiovascular, reproductive and neuralgic problems.
  - 2. Through physical examination with particular attention to tooth, gums, hematological, gastrointestinal, renal cardiovascular, and neurological systems. Pulmonary status must be evaluated if respiratory protection will be used.
  - 3. Blood sample and analysis which determines:
    - a. Blood lead level;
    - b. Hemoglobin and Hematocrit determinations, red cells indices and examination of peripheral smear Morphology;
    - c. Zinc protoporphyrin;
    - d. Blood Urea Nitrogen (BUN);
    - e. Respirator Health Check;
    - f. Pulmonary function testing;
    - g. Chest X-ray;
    - h. Electrocardiogram.
- C. Employees may seek a secondary physician for a second opinion to review initial results, and conduct examination consultations and laboratory tests deemed necessary. If two physicians disagree and are unable to resolve differences a third physician may be contacted (see OSHA Lead Standard [29 CFR 1910.1025(j)] for more details).

#### 1.11 TRAINING

- A. As required by applicable regulations, prior to assignment to lead Work instruct each employee with regard to the hazards of lead, safety and health precautions, and the use and requirements of protective clothing and equipment.
- B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.62. Provide respirator training and fit-testing.



## 1.12 RESPIRATORY PROTECTION

- A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.
- B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.
- C. Respiratory protection will be based upon whether Class 1, 2, and 3 tasks are being performed, in accordance with 29 CFR 1926.62.
- D. No respirators shall be issued to personnel without such personnel participating in a respiratory training program.
- E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.62.
- F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.
- G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the Workday. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.
- H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour Workday.
- I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.
- J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

## 1.13 DELIVERY AND STORAGE

- A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
- C. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
- D. Protect materials from unintended contamination.
- E. Remove damaged or deteriorated materials from the job site. Materials contaminated with lead shall be disposed of as lead debris as herein specified.

## 1.14 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the lead Work Areas.

- B. Provide temporary 120-280 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the lead Work Area.
  - 1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
  - 2. Provide temporary wiring and "weatherproofreceptacles in sufficient quantity and location to serve all HEPA equipment and tools.
  - 3. Provide wiring and receptacles as required by the Environmental Consultant for air sampling equipment.
  - 4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.
- C. Provide temporary lighting with "weatherprooffixtures for all Work Areas including decontamination chambers.
  - 1. The entire Work Area shall be kept illuminated at all times.
  - 2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.
- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

## PART 2 - PRODUCTS

### 2.01 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, headcoverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing lead Work.
- C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.
- D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

### 2.02 SIGNS AND LABELS

- A. Provide warning signs and barrier tapes at all approaches to lead Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
  - 1. Provide danger signs in vertical format conforming to 29 CFR 1926. Minimum 20" x 14" displaying the following legend.

**DANGER  
LEAD WORK AREA  
POISON  
NO SMOKING OR DRINKING**

**AUTHORIZED PERSONNEL ONLY  
RESPIRATORS AND PROTECTIVE  
CLOTHING ARE REQUIRED IN THIS AREA**

1. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER LEAD REMOVAL". Locate barrier tape across all corridors, entrances and access routes to lead Work Area. Install tape 3' to 4' AFF.
- B. Provide lead danger labels affixed to all lead materials, scrap, waste, debris and other products contaminated with lead.
  1. Provide lead danger labels of sufficient size to be clearly legible, displaying the following legend, or equivalent:

**DANGER  
CONTAINS LEAD  
AVOID CREATING DUST  
POISON HAZARD**

1. Provide the following lead labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport lead contaminated material in accordance with United States Department of Transportation 49 CFR, Part 745.
2. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:
  - a. Generator Name:
  - b. Facility Name:
  - c. Facility Address:

### 2.03 PROJECT LOG BOOK

- A. Provide a permanently bound Project log book of minimum 8-1/2" x 11" size. Log book shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Lead Contractor; emergency numbers including, but not limited to local Fire/Rescue department.
- B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.
- C. All persons entering and exiting the Work Area shall sign the log and include name, social security number, and time.
- D. The Project Supervisor shall document all Work performed daily and note all inspections.

### 2.04 SCAFFOLDING AND LADDERS

- A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.
- B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

## 2.05 SURFACTANT (AMENDED WATER)

- A. Wet all lead-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

## 2.06 ENCAPSULANT

- A. Following lead scrapping, an encapsulant material shall be applied to the scrapped surfaces and remaining surfaces containing lead-based paint.
- B. Approved Manufacturer:
  - 1. KapsulKote Inc.: KapsulKote II System – PrimerKote and FinishKote
  - 2. Premier Coatings, Inc.: Lead Block
  - 3. GLOBAL Encasement, Inc.: LeadLock GE-40
  - 4. Fiberlock Technologies, Inc.: L-B-C Lead Barrier Compound
  - 5. Fiberlock Technologies, Inc.: LeadMaster

## 2.07 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags. Bags shall also be imprinted with U.S. Department of Transportation required markings.
- B. Provide 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight if lead waste has the potential to damage or puncture disposal bags. Affix lead caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated.
- D. Labeled lead waste containers or bags shall not be used for non-lead waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as lead waste.

## 2.08 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.
- C. Approved Manufacturers:
  - 1. Hako Minuteman
  - 2. Micro-Trap Inc.
  - 3. Control Resource Systems, Inc.

## 2.09 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb lead material shall be equipped with HEPA filtered local exhaust ventilation.

## 2.10 POLYETHYLENE SHEETING

- A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.
- B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

## PART 3 - EXECUTION

### 3.01 GENERAL REQUIREMENTS

- A. Should the area beyond the Work Area(s) become contaminated with lead containing materials, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for lead removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.
- B. Medical approval, fit test reports, Worker Acknowledgments, and EPA certificates shall be on site prior to admittance of any Contractor's employees to the Work Area.
- C. Perform all lead removal Work using wet removal procedures. Mix and apply surfactant in accordance with manufacturers written instructions. Dry removal procedures are not permitted.
- D. The following documents shall be posted at the site at an approved location:
  - 1. Company license.
  - 2. Daily personal air monitoring results.
  - 3. Worker's EPA certificates (copies are acceptable provided Workers have original certificates in their possession).
  - 4. Medical records.
  - 5. Fit test reports.
  - 6. Project specifications.
  - 7. Project drawings.
  - 8. Notifications.
  - 9. Applicable regulations.
  - 10. Material Safety Data Sheets.
  - 11. Lead Work plan.
  - 12. List of emergency telephone numbers.
  - 13. Waste Disposal Log
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

### 3.02 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Provide a personnel decontamination enclosure contiguous to the Work Area, unless otherwise specified. The decontamination enclosure shall be attached to the Work Area and not located within it. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. Alternately, a remote decontamination enclosure can be situated within 150 feet of the Work Area. Contamination enclosure requirements set forth in this part shall apply with the exception to Section 3.02B. Access to the Work Area will not be directly through the decontamination enclosure.

- B. Access to the Work Area will be from the clean room through an air-lock to the shower, through an air lock to the equipment room then into the Work Area. Each airlock shall be a minimum of three feet from door to door.
- C. The decontamination enclosure ceiling and walls shall be covered with two layers of opaque 6 mil fire retardant polyethylene sheeting. Two layers of 6 mil fire retardant reinforced polyethylene sheeting shall be used to cover the floor.
- D. Establish a triple layer of six mil fire retardant polyethylene at the decontamination chamber doorways, weighted to insure a tight seal of the enclosure. Prior to establishing doorway seals move all required tools, scaffolding, and equipment into the Work Area.
- E. The entrance to the clean room shall have a lockable door. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.
- F. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.
- G. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be collected in a non-corrosive container and disposed of as lead waste according to all applicable laws.
- H. The equipment room shall be used for the storage of tools and equipment. A labeled 6 mil plastic waste bag for collection of contaminated clothing shall be located in this room.
- I. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Lead Project Monitor.

### 3.03 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Access to and from the Work Area is permitted only through the personnel decontamination enclosure.
- B. Workers shall sign the entry/exit log upon every entry and exit.
- C. The following procedures shall be followed when entering the Work Area:
  - 1. Before entering the Work Area, workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators. Two layer of protective clothing shall be required when a remote decontamination enclosure is being utilized.
  - 2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.
- D. The following procedures shall be followed when exiting the Work Area:
  - 1. Before leaving the Work Area, gross lead contamination will be removed by wet cleaning and HEPA vacuuming. At least two wet cleanings shall be performed with separate cleaning solutions and rinse waters.
  - 2. In the equipment room, workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room. For remote decontamination enclosures, one layer of protective clothing shall be removed prior to exiting the Work Area air lock.

3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal. Disposal towels shall be provided as well as a 6 mil plastic disposal bag for the collection of the contaminated towels.
4. Upon exiting the shower, workers shall don new disposable clothing if work shift is to continue or street clothes to exit area. Under no circumstances shall workers enter public non-Work Areas in disposable protective clothing.

#### 3.04 WORK AREA PREPARATION

- A. Danger signs shall be posted at all approaches to the Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs. The Work Area shall be considered to include the entire room in which the window or door being addressed is located and any exterior locations constructed to enable the activities.
- B. Shut down and lock out the building heating, ventilating, and air conditioning and electrical systems. Provide temporary electric power and lighting as specified herein.
- C. All surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited.
- D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.
- E. Should a construction barrier be constructed at the window or door opening being addressed, Section 3.05K will not be required.
- F. All non-movable equipment in the Work Area shall be completely covered with 2 layers of fire retardant polyethylene sheeting, at least 6 mil in thickness, and secured in place with duct tape and/or spray adhesive.
- G. Provide enclosure of the Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved Work plan and as specified herein.
- H. Seal off all openings including but not limited to windows, diffusers, grills, electrical outlets and boxes, doors, floor drains, and any other penetrations of the Work Area enclosure, using 2 layers of at least 6 mil fire retardant polyethylene sheeting to form a critical barrier.
- I. Provide temporary framing and sheathing at openings larger than 32 square feet, which form the limits of the Work Area. Sheathing thickness must be a minimum of 3/8 inch and all sheathing shall be caulked and the Work Area side sealed with two layers of 6 mil fire retardant polyethylene sheeting to form an isolation barrier.
- J. Isolation barriers shall be installed at all elevator openings in the Work Area. Elevator controls shall be modified so that elevators bypass the Work Area.
- K. Provide two layers of 6 mil fire retardant polyethylene sheeting over all floor, wall, and ceiling surfaces. Isolation barriers shall also be covered with two layers (for a total of four layers). Sheeting shall be secured with spray adhesive and then sealed with duct tape. All joints in polyethylene sheeting shall overlap 12" minimum. Note that floor sheeting does not eliminate dust clearance sampling of the floor area below the sheeting and/or sampling of the sheeting floor area. Failure of either type of dust clearance sampling requires additional cleaning of the Work Area by the Contractor at no additional expense to the Owner.

- L. Frame out emergency exits. Provide double layer 6 mil fire-retardant polyethylene sheeting and tape seal opening. Post as emergency exits only. Within the Work Area, mark the locations and directions of emergency exits throughout the Work Area using exit signs and/or duct tape.

### 3.05 RENOVATION AND REMOLDING OF LEAD-BASED PAINT

- A. Renovation and Remolding shall be conducted in accordance with the Contract Documents and the approved Lead Work Plan.
- B. If Lead-based Paint surfaces need to be addressed then it should be accomplished with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material if it does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while lead based paint is being removed.
- D. Removal of lead-based paint shall be accomplished through manual scrapping.
- E. Perform cutting, drilling, abrading, or any penetration or disturbance of lead containing material in a manner to minimize the dispersal of lead into the air. Use equipment and methods specifically designed to limit generation of airborne particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.
- F. Upon removal of lead from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc. Wet and bag the debris as it is removed, using a 6 mil plastic disposable bag.
- G. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate or whenever there is enough accumulation to fill a single bag or container. Maintain the surfaces of the Work Area free of accumulation of lead debris.
- H. Dust-tight enclosed inclined chutes shall be used for materials dropped from distances greater than 10 ft.
- I. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.
- J. Power or pressure washers will not be allowed to be used for lead-based paint removal or clean-up procedures.
- K. All construction and demolition debris determined by the Environmental Consultant to be contaminated with lead shall be handled and disposed of as lead waste.

### 3.06 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

- A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The Work Area persons shall not enter the airlock. Large components may be moved directly to a waste container when a remote decontamination enclosure is being utilized. The component must be decontaminated within the work area and pose no health concerns when removed from the Work Area.



- B. The cleaned containers of lead material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.
- C. Containers and equipment shall be moved from the work area and into a holding area by persons dressed in clean personal protective equipment, who have entered from uncontaminated areas.
- D. The cleaned containers of lead material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- E. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- F. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

### 3.07 WORK AREA DECONTAMINATION

- A. Following completion of gross removal activities and after all accumulations of lead waste materials have been containerized, the following decontamination procedures shall be followed, unless otherwise specified.
- B. Daily Cleaning:
  - 1. According to the HUD Guidelines, "A thorough cleanup of the entire area under active abatement should occur daily during the entire abatement process. This daily cleanup should consist of the following:
    - a. Large Debris:
      - 1) Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to the area designated for trash storage on the property. Since lead-contaminated debris is a potentially hazardous waste, it should never be stored outside while awaiting removal/disposal. Consequently, an area inside the property must be designated as a temporary trash storage area, unless an approved container is to be located exterior to the building.
    - b. Small Debris:
      - 1) Small debris should be collected by wet mopping or wet sweeping and disposed of properly. However, before any sweeping occurs, the affected surfaces should be sprayed with a fine mist of water, to keep surface dust from becoming airborne and potentially contaminating other areas of the property and lead workers. Dry sweeping is prohibited. The swept debris should be placed in double 4-mil or single 6-mil plastic bags, properly sealed, and moved to the designated trash storage area. Care should be taken not to overload trash bags, which otherwise may rupture or puncture during handling and transport.
    - c. Exterior Cleanup:
      - 1) Using a containment system should protect unabated areas potentially affected by exterior lead activities. Because weather can adversely affect the exterior of the containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleanup, the immediate area should be examined visually to ensure that no lead debris has escaped containment. Any such debris should be raked or wept

swept and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris.

- 2) At the conclusion of the lead activities, a final cleanup must occur. This is a much more thorough process than the daily cleanup. Failure to perform an adequate final cleanup will result in failure to pass post-lead-dust clearance.

C. Preliminary Final Cleanup:

1. Before final cleanup can begin and before abated surfaces can be painted or sealed, the plastic sheeting used for containment must be removed. This contaminated plastic sheeting must be removed and disposed of very carefully. Removal should start with upper-level plastic, as applicable. The plastic should be sprayed or misted with water to hold down dust, and then folded in upon itself to trap any dust residues inside. Before removal of floor plastic, it should be sprayed and swept as detailed earlier in this chapter. It should be folded carefully from the corners/ends to the middle to trap any remaining lead dust and placed into double 4-mil or single 6-mil plastic bags that are then sealed and removed from the premises. As with daily cleanups, this plastic removal process requires the use of protective equipment, especially appropriate respirators. Plastic sheets used to isolate contaminated rooms from non-contaminated rooms should not be removed at this time. These sheets should remain until after the preliminary final cleanup/final cleanup is complete and satisfactory lead dust clearance results are obtained. Then the plastic sheets used to isolate contaminated rooms from non-contaminated rooms should be carefully removed as described above.
2. After the plastic has been removed from the contaminated area, the entire area should be HEPA-vacuumed as detailed in HUD Guidelines, Section 10.2.1, starting with the rooms farthest from the entrance to avoid retracking dust through the already-cleaned area. In each room, vacuuming should begin with the ceilings and proceed down the walls, making sure every surface is treated, including doors and door trim, windows, window sills, wells, and trim, baseboards, etc
3. The entire affected area should next be washed down with a TSP solution as detailed above and then it should be HEPA-vacuumed again using the steps already outlined. The contractor must not deviate from or skip any step. To do so could mean that hazardous levels of lead dust and residue could be embedded in the new paint and mobilized later when that paint deteriorates or is abraded.
4. Prior to and after isolation and critical barriers are removed, the Lead Project Monitor shall inspect the Work Area for cleanliness. If necessary, additional cleaning shall be performed by the Contractor as directed by the Lead Project Monitor.
5. As a result of any visual inspection by the Lead Project Monitor, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

D. Final Cleanup Procedures

1. The final clean-up procedures is as follows:
  - a. Remove the top layer of 6-mil poly and seal in bags or clean 6-mil poly.
  - b. Remove bags of poly and store in a secure area.
  - c. Vacuum all surfaces with a HEPA-equipped vacuum beginning with the ceiling and working down.
  - d. Wash all surfaces with TSP (trisodium phosphate) detergent.
  - e. Vacuum all surfaces a second time.
  - f. Wash all surfaces a second time.
  - g. Remove all contaminated equipment and material to secure storage area.
  - h. Removal final layer of poly, except isolation and critical barriers are to remain. Isolation and critical barriers are to be removed following satisfactory lead wipe clearance results.
  - i. Vacuum floors with HEPA-equipped vacuums.
  - j. Wash surfaces again with TSP.
  - k. Vacuum again.
  - l. Seal surfaces with paint, polyurethane, or wax.

- E. Cleanup Confirmation (Lead Dust Clearance)
  - 1. The LPM will be collection lead wipe samples to confirm the effectiveness of the cleanup activities. Lead-dust results shall be available within 24 hours of completing sampling. Following satisfactory reporting of the results, all isolation and critical barriers shall be removed. Should results indicate lead-dust present at concentrations exceeding the acceptable guideline level, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.
  - 2. The established clearance level for dust-lead for floors is 10 micrograms per square foot (ug/ft<sup>2</sup>) and for window sills the clearance level is 100 micrograms per square foot (ug/ft<sup>2</sup>). This level has been established as part of Title 40 of the Code of Federal Regulations Part 745 (40 CFR Part 745). If the contractor should fail the wipe tests for lead dust clearance, the contractor shall pay for additional testing until clearance is obtained

### 3.08 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

- A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.
- B. Finishes damaged by lead activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.
  - 1. Finishes unable to be restored shall be replaced under this Contract.
  - 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of lead activities.

## PART 4 - DISPOSAL OF LEAD WASTE

### 4.01 APPLICABLE REGULATIONS

- A. All lead waste shall be stored, transported and disposed of in accordance with the following regulation(s) as a minimum:
  - 1. NYS DEC 6 NYCRR

### 4.02 TRANSPORTATION AND DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.
- B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal Working hours unless otherwise specified. No waste may be taken from the site unless the Environmental Consultant is present and authorizes the release of the waste as described herein.
- C. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.
- D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.
- E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Waste Manifests.

- F. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site lead material. The Hauler must travel directly to the disposal site without unauthorized stops.

#### 4.03 WASTE STORAGE CONTAINERS

- A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.), open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).
- B. The Environmental Consultant shall verify that the waste storage container tags (license plates) match that listed on the New York State Department of Environmental Conservation permit. Any container not listed on the permit shall be removed from the site immediately.
- C. The container shall be plasticized and sealed with a minimum of one (1) layer of 6 mil polyethylene on the sides and two (2) layers of 6 mil polyethylene on the floor.
- D. While on-site, the container shall be labeled with EPA Danger signage:

**DANGER  
CONTAINS LED  
AVOID CREATING DUST  
POISON HAZARD**

- E. The New York State Department of Environmental Conservation Hauler's Permit number shall be stenciled on both sides and back of the container.
- F. Once the container is loaded at the site, the door(s) will be locked at all times.
- G. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.
- H. Before the container is removed from the Project Site for transportation to the Disposal Site the locks shall be removed at the Disposal Site by the operator of the Disposal Facility and returned by the Disposal Facility to the Contractor.
1. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

**END OF SECTION 028300**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes but is not limited to the following:
  - 1. Under slab on grade vapor retarder
  - 2. Interior Catch Basins
  - 3. Concrete Formwork and Accessories
  - 4. Sleeves and Blockouts for Concrete Work
  - 5. Concrete Form Release Agent
  - 6. Waterstops in Concrete
  - 7. Floor Anchor Pots
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 032000 - Concrete Reinforcements
  - 2. Section 033000 - Cast-in-Place Concrete
  - 3. Section 079200 - Sealants

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ACI 301 "Specifications for Structural Concrete"
- C. ACI 318 "Building Code Requirements for Structural Concrete".
- D. ASTM E96 "Standard Test Methods for Water Vapor Transmission of Materials:.
- E. ASTM E1643 "Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs".
- F. ASTM E1745 "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data and installation instructions for the following:
  - 1. Apparatus Bay Catch Basins
  - 2. Vapor Retarders
  - 3. Concrete Form Release Agent
  - 4. Sleeves
  - 5. Waterstop
  - 6. Concrete Vertical Construction Joints
- D. Shop Drawings: Provide shop drawings for the following:
  - 1. Apparatus Bay Catch Basins.

2. Locations and details of vertical construction joints in cast-in-place concrete walls.

#### 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.

### PART 2 PRODUCTS

#### 2.01 FORMWORK MATERIALS

- A. Description: In addition to ACI 301 requirements, provide forms that retain their shape and strength after exposure to severe weather conditions.

#### 2.02 PLYWOOD FORMS

- A. Description:
  1. For natural concrete finish, smooth or rough form: APA B-B Plyform or better.

#### 2.03 FORM ACCESSORIES

- A. Bevel (Chamfer) and Reveal (Rustication) Strips: Clear softwood, planed, not rough sawn. PVC or rubber may be used if held rigid and straight.
  1. Bevel size: 3/4 in. x 3/4 in. unless otherwise shown.
  2. Reveal size: 3/4 in. deep x 1-1/4 in. wide trapezoid at surface of concrete, unless otherwise shown.
- B. Stiffeners, Clamps, Frames, Walers, Strongbacks, Braces, Scaffolds, Ties, Bolts and Other Components of Formwork Assemblies: Provide as needed to produce formwork specified in ACI 301.
- C. Form Release Agent: Compound that will release forms without discoloring concrete, will not impart roughness of concrete and will not interfere with adhesion, color of coatings or other construction which is to be applied over concrete. Do not use oil. Agent must meet project VOC requirements.

#### 2.04 EMBEDDED ITEMS

- A. Sleeves: Galvanized steel or plastic with wall thickness not less than 1/8 in.
- B. Block outs: Wood or rigid foam plastic; removable without damage to concrete.

#### 2.05 SIDE FORMS

- A. Description: Use clean steel or wood forms with stakes or other supports which will withstand fluid, placing and finishing pressures without bowing, inclining or leaking.
  1. Top Edges: Smooth and straight, suitable for use as screeds in guiding strike offs without bumps or chatter.

## 2.06 JOINT FILLER AND SEALANT

- A. Non-extruding, Resilient, Preformed Fiber Joint Filler: Asphalt saturated cellulose fibers or cork particles encased between two (2) asphalt saturated glass felt liners.
  - 1. Cap: Provide plastic cap at top edge of joint filler strip to protect filler from dirt intrusion and as a bond breaker when sealant is applied.
  - 2. Sealant: See Section 079200 - Sealants.
  - 3. Referenced standard: ASTM D1751.
  - 4. Bond Breaker: 15 lb./sq. asphalt coated glass fiber base sheet cut in strips equal to full depth of joint.
    - a. Referenced standard for base sheet: ASTM D4601, Type I.

## 2.07 DRAINAGE FILL

- A. Description: 3/4 in. washed crushed stone or gravel, or as otherwise specified in Division 31 - Earthwork.

## 2.08 CONSTRUCTION JOINT (VERTICAL (WALL) APPLICATIONS)

- A. Key-Loc Joint System by Form-A-Key Products, Division of Cardinal Mfg. Co., Inc., Louisville, NY 40214, 502-361-1396; fax 502-363-5905 or approved equivalent.
- B. Metal keyway shall be 24-gauge galvanized steel with dowel knockouts at 6" centers.
- C. Wood forms for construction joints may be used in lieu of prefabricated metal keyways.
- D. Accessories include splice pieces, stakes and clips and stay-in-place cap Model #2137.

## 2.09 SLAB ON GRADE VAPOR RETARDER

- A. Slab on grade with radiant tubing.
  - 1. Insul-Tarp Insulation by Insulation Solutions, Inc., 401 Truck Haven Road, East Peoria, IL 61611 Phone 1-866-698-6562 for use below all slabs with radiant heat tubing.
    - a. Seam Tape: 4" wide white polyethylene tape
- B. Slab on grade unheated slab
  - 1. Vapor Retarder
    - a. Vapor Retarder must have the following qualities:
      - 1) WVTR less than or equal to 0.006 gr/ft<sup>2</sup>/hr. as tested by ASTM E 96
      - 2) ASTM E 1745 Class A (Plastics)
      - 3) Vapor Retarder Products
        - (a) Stego Wrap (15 mil) Vapor Barrier by Stego Industries, LLC, San Juan Capistrano, CA 877-464-7834, [www.stegoindustries.com](http://www.stegoindustries.com) .
        - (b) PERMINATOR® HP 15 mil Underslab Vapor Barrier (High Puncture Resistance) by W.R. Meadows, Inc., PO Box 338, Hampshire, IL 60140-0338 Phone: 800-342-5976
        - (c) Husky® Yellow Guard® 15 mil under slab vapor barrier by Poly-America, L.P., 2000 West Marshall Dr., Grand Prairie, TX 75051 800-527-3322
  - 4) Vapor Retarding Seam Tape
    - (a) Tape must have the following qualities:
      - (1) Water Vapor Transmission Rate: ASTM E 96 - 0.3 perms or lower
  - 5) Vapor Proofing Mastic
    - (a) Mastic must have the following qualities:
      - (1) Water Vapor Transmission Rate: ASTM E 96 - 0.3 perms or lower

- 6) Pipe Boots
  - (a) Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturers' instructions.

## 2.10 WATERSTOP

- A. Sika Greenstreak® PVC Waterstop or Architect Approved Equivalent meeting Army Corp. of Engineers CRD-C 572-74 requirements.
  - 1. #703 6" x 3/16" ribbed with centerbulb.
  - 2. Accessories: Provide junction making material and factory formed T's, L's and X's.
- B. Hydrophilic Waterstop
  - 1. CETCO® Waterstop RX 101 or Architect Approved Equivalent.
  - 2. Adhesive: CETSEAL Sealant/Adhesive or manufacturer's recommended adhesive product.

## PART 3 EXECUTION

### 3.01 APPARATUS BAY CATCH BASINS

- A. Catch Basins must be set to meet all tolerances as defined in Section 033500 - Concrete Finishing.
- B. Provide all required holes in catch basins for piping provided by PC.
- C. Catch Basins and encapsulating concrete should be isolated from the expansion and contraction stress of the adjacent slabs.
- D. Grout bottom of catch basin with non-shrink grout to provide positive slope to pipe invert. Grout layer to prevent any free-standing water in catch basin.

### 3.02 VAPOR RETARDER INSTALLATION

- A. General: Following leveling and tamping of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour. Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
- B. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments (such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier). At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
- C. Lap joints 6 inches (150 mm) and tape continuously per manufacturer's installation instructions.
- D. Apply seam tape to a clean and dry vapor barrier.
- E. Seal all penetrations (including pipes) per manufacturer's instructions.
- F. Avoid the use of non-permanent stakes driven through vapor retarder. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
- G. Once vapor retarder is installed limit traffic on vapor retarder to foot traffic necessary to install reinforcing, radiant tubing and concrete.



- H. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

### 3.03 WATERSTOP INSTALLATION

- A. PVC Waterstop:
  - 1. PVC Waterstop must be installed prior to concrete placement to ensure proper positioning and concrete consolidation around the waterstop.
  - 2. All transitions, intersections, and splices must be heat welded to maintain continuity.
  - 3. Factory made fabrications shall be used at all intersections and changes in direction.
  - 4. Support upper portion of waterstop with use of hog rings and wires to properly position the waterstop in the second pour.
  - 5. Follow waterstop manufacture's installation guidelines.
- B. Hydrophilic Waterstop;
  - 1. Install in accordance with manufacturer's installation instructions using recommended adhesive.
  - 2. Do not subject installed hydrophilic waterstop to submersion or remain in extended contact with water prior to encapsulation in concrete. If the waterstop exhibits swelling prior to encapsulation, it must be replaced with new material.

### 3.04 MODIFICATIONS TO ACI 301

- A. The following provisions modify (change, delete from or add to) ACI 301. Where any part of ACI 301 is modified by these provisions, the unaltered parts of ACI 301 shall remain in effect. Where "acceptable" is used or "subject to acceptance" is required in ACI 301, acceptance shall mean approval by Architect or Structural Engineer of record.
- B. Chapter 4, Formwork:
  - 1. ADD to Par. 4.1.3. Form sides of footings except in rock that has been cut to precise footing profile.
  - 2. ADD to Par. 4.2.7. Seal joints at temporary openings and between form pieces with compressible tape that will not leak grout or water; flush with exposed surface.
  - 3. ADD to Table Par. 4.3.1: 7.C. Slope toward nosing in step treads: 1/16 in. +/- 1/32 in. Treads shall not pond water at any point.
  - 4. Par. 4.4.2.1. DELETE "acceptable". No approval of form coating is required if the Specification for form release agent is met.
  - 5. ADD to Par. 4.5.5. Minimum strength of concrete in beams and slabs at time of form removal: 75% of specified  $f'_c$  as determined by cylinder compression tests. Re-shore until  $f'_c$  equals 100% of design strength.
- C. Chapter 6, Joints and Embedded Items.
  - 1. Par. 6.1.4. DELETE "When required or permitted, bond shall be obtained by ..." REPLACE with "Obtain bond by ...".
  - 2. ADD to Par. 6.2.2. When the Work is nearly complete, clean top of joint filler, install bond breaker and seal with self-leveling urethane sealant. Plastic cap at top of joint filler material may be used as bond breaker if depth of urethane will be equal to approximately half of joint width.
  - 3. ADD to Par. 6.3.2. Set waterstops in place with centerline of waterstop at centerline of joint. Secure waterstops in straight lines without twisting. Wire extreme outer edge of waterstop to reinforcing on each side, or, in the case of split flanges, nail fully spread against joint form. Carry waterstops around corners, without splicing.
  - 4. ADD to Par. 6.3.3. Use prefabricated Ts, Ls, and crosses so that all splices are butt joints.
  - 5. ADD Par. 6.3.4. Clean dust, dirt, and hardened concrete from waterstops, then vibrate fresh concrete around waterstops so that full bond with concrete is ensured, free of voids.

- D. Chapter 9, Repair of Surface Defects.
1. ADD Par. 9.1.1. Grind fins and projections as needed to allow smooth application of waterproofing and finishes.
  2. ADD Par. 9.1.2. Fill honeycomb, bugholes, and other voids or depressions as needed to allow smooth application of waterproofing and finishes.
- E. Chapter 10, Finishing of Formed Surfaces.
1. ADD to Par. 10.2.1. At surfaces to which waterproofing will be applied, provide rough form finish and prepare surface by grinding fins and projections, removing nails, and by filling honeycomb, bugholes, and other voids or depressions with firmly adhered grout.
  2. ADD to Par. 10.2.2. Provide smooth form finish at exposed surfaces, whether or not shown to receive architectural finish.
  3. ADD to Par. 10.4.2. In addition to walls, columns, ceilings, and soffits generally, surfaces exposed to public view include, but are not limited to, surfaces such as walls of interior and exterior stairways, elevator hoist ways, walls and ceilings in spaces or tunnels with 6 ft or greater headroom, and backs of parapet walls. Surfaces which will receive furring, contact plaster, or suspended ceiling are not exposed surfaces.
- F. Chapter 11, Slabs.
1. ADD to Par. 11.2.1. Place interior slabs on ground over a subbase course of drainage fill that has been compacted to a thickness of at least 8 in., or as indicated in drawings, whichever is greater.
  2. ADD the following to Par. 11.2:
    - a. 11.2.4 Place and seal vapor retarder under base course or other substrate.
    - b. 11.2.5 Lap vapor retarder sheet sides and ends 6 in. Turn sheets up 4 in. above top of sub-slab fill at walls and columns.
    - c. 11.2.6 Protect vapor retarder from puncture before and during sub-slab fill placement.
  3. ADD the following paragraphs to Par. 11.5:
    - a. 11.5.1. Wall Isolation Joints. Isolate edges of interior slabs on ground from concrete wall surfaces with 1 layer of bond breaker felt or joint filler strip except as shown in drawings.
    - b. 11.5.2. Column Isolation Joints. Form diamond-shaped area around each column, each side equal to 2'-6". After slabs have been cast, strip forms, install bond breaker at slab edges, then place concrete around columns.
    - c. 11.5.3. Contraction joints (control joints, sawed joints). Cut alternate wires or bars in reinforcement passing through joint. Saw joints to a depth of 1/3 slab thickness as soon as concrete will not ravel. Vacuum or blow groove clean immediately after sawing and insert backer rod to keep joint clean during construction. At least 90 days later, or just before time of Substantial Completion, remove rod, clean groove of debris, replace rod and fill with dead level urethane sealant.
  4. ADD the following paragraphs to Par. 11.9:
    - a. 11.9.1.1. Provide Class A tolerances at floor areas as shown.
    - b. 11.9.2.1. Finish all floor areas to Class B tolerance except as otherwise shown.
    - c. 11.9.3.1. Class C flatness tolerances may be provided at floor areas which will receive mortar beds for finish materials.
  5. ADD paragraph 11.10 Exterior Traffic Surfaces:
    - a. 11.10.1. Provide broom finish at exterior walks, aprons, man-door slabs and ramps.

**END OF SECTION 031000**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.
- B. Section 031000 - Concrete Forming and Accessories
- C. Section 033000 - Cast-In-Place Concrete

## 1.02 SCOPE

- A. Furnish labor and materials necessary to install a complete system.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ACI 301 "Specifications for Structural Concrete for Buildings".
- C. ACI 318 "Building Code Requirements for Reinforced Concrete".
- D. ASTM A82 "Standard Specification for Steel Wire, Plain, for Concrete Reinforcement".
- E. ASTM A185 "Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement".
- F. ASTM A615 "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement with Supplementary Requirements".
- G. ASTM A617 "Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - SUBMITTALS.
  - 1. Design reinforcing for structural adequacy and compliance with Contract Documents. Obtaining approval required by public authorities shall be responsibility of Contractor. Architect's review and approval will be for compliance with Contract Documents only.
- B. Submit pursuant to Section 016100 - BASIC PRODUCT REQUIREMENTS.
- C. Submit product data for fiber reinforcing to be incorporated in ready mix concrete if required.
- D. Shop Drawings: Submit the following:
  - 1. Cutting and bending diagrams.
  - 2. Placing drawings.
- E. Certificates of Compliance for all grades and types of: reinforcing steel and welded wire mesh used on the project.

## 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.
- B. Standards: The following standards establish the over all level of quality for products and execution: ACI 301 "Specifications for Structural Concrete for Buildings", ACI 318 "Building Code Requirements for Reinforced Concrete", CRSI MSP-1-86 "Manual of Practice", and CRSI RAS-2-84 "Reinforcement Anchorages and Splices".
  - 1. Articles or paragraphs starting with a chapter (Chapter), table (Table), or a paragraph (Par.) number refer to ACI 301 and incorporate that part of the referenced standard into this Specification. Text following each reference to ACI 301 modifies the referenced standard.
  - 2. The words "approved" and "accepted" in this Section and in ACI 301 shall mean approved and accepted by the Architect or the Structural Engineer of record.
- C. Regulatory Requirements:
  - 1. Provide reinforcing shop drawings and submit to the Architect and Structural Engineer of record for approval.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Ship reinforcing steel in bundles.
- C. Tag each bundle at the mill with a waterproof tag, in accordance with "Manual of Standard Practice" of the CRSI, showing the name of the mill, heat number, grade, size and identifying number.
- D. Store above ground on adequate height dunnage to keep reinforcing material out of dirt, mud and snow.
- E. Adequately support reinforcing materials to prevent bending and curling of bars and sheets.

## PART 2 PRODUCTS

## 2.01 MODIFICATIONS TO ACI 301

- A. The following provisions replace or repeat parts of ACI 301. Unaltered provisions of Chapter 5 in ACI 301 remain in effect.

## 2.02 REINFORCING BARS

- A. Description: Billet steel deformed bars. Provide plain bars only where shown.
  - 1. Yield strength: 60,000 lb./sq. in. minimum; Test 8.
  - 2. Elongation in #4 to #6 bars, 8 in. long: At least 9%; Test 8.  
Ability to withstand 180-degree bend around pin without cracking;

| BAR SIZE | BENDING PIN SIZE           |
|----------|----------------------------|
| #3 to #5 | 3.5 bar diameters or less. |
| #6 to #8 | 5 bar diameters or less.   |
| #9-#11   | 7 bar diameters or less.   |
| #14-#18  | 9 bar diameters or less.   |

3. Phosphorus content: 0.06% maximum; Test 5.
- B. Referenced Standards:
1. Par. 5.2.1, 5.2.2. of ACI
  2. ASTM A615, Grade 60.
- C. Reinforcing steel shall be clean and free from scale, oil, and defects.

#### 2.03 WELDED WIRE FABRIC

- A. Description: Plain welded steel wire grid, and deformed welded steel wire grid, uncoated. Provide in flat sheets. Welded intersections shall not be spaced farther apart than 6" in each direction
- B. Referenced Standards:
1. Par. 5.2.4, 5.2.5. of ACI
  2. Plain wire: ASTM A82.
  3. Plain welded wire fabric: ASTM A185.
  4. Deformed welded wire fabric: ASTM A497.5.

#### 2.04 TIE WIRE

- A. Description: Annealed steel wire of sufficient gage to hold reinforcing steel in place under construction loads. Coating of wire shall be the same as the coating, if any, on reinforcing steel.

#### 2.05 SUPPORTS FROM GROUND OR MUD MAT

- A. Description: Steel, galvanized steel, or molded plastic bolsters, chairs, and spacers, or precast concrete blocks, sufficient to withstand construction loads.
- B. Referenced Standards: Par. 5.7.3, 5.7.3.1. of ACI.

#### 2.06 FIBER REINFORCEMENT

- A. Description: Fiber mesh reinforcing for slabs.
1. Qualities: Polypropylene fibers engineered and designed for secondary reinforcement of concrete slabs, batch plant mixed at a minimum rate of 1.5 lbs. per cubic yard and fibers not less than 1/2" long.
  2. Standard: ASTM C 1116, Type III.
  3. Sources (or approved equal):
    - a. Durafiber, Durafiber Corp.
    - b. Fibermesh, Fibermesh Co., Div. Synthetic Industries, Inc.
    - c. Grace Fibers, W.R. Grace & Co.

### PART 3 EXECUTION

#### 3.01 REINFORCING LAP SPLICES & CORNER BARS

- A. Reinforcing shall be spliced with laps equal to 40 bar diameters (i.e. #6 bar = 30-inch lap).
- B. Provide corner bars in walls of the same size and frequency as the horizontal bars in the wall adjacent walls. When size or frequency varies between walls, use the size of the larger bar and its frequency for the corner bars.

## 3.02 MODIFICATIONS TO ACI 301

- A. The following provisions modify (change, delete from or add to) ACI 301. Where any part of Chapter 5 in ACI 301 is repeated or modified by these provisions, unaltered parts of ACI 301 remain in effect.

## 3.03 CHAPTER 5, REINFORCING

- A. ADD: 5.2.7 Ties and Stirrups: Provide deformed bars of same grade as main reinforcing of beam or column. Where deformed bars or matching grade of steel are not available in specified tie or stirrup size, provide ties or stirrups that will develop equal withdrawal resistance and tensile load resistance.
- B. ADD to table in Par. 5.7.1: Unformed surfaces in parking structures, vehicular ramps, and bridge decks. Minimum cover 2-1/2 in. unless dimensioned otherwise.
- C. ADD to 5.7.3: Turn back tie wires at formed surfaces.
- D. ADD to 5.7.4: Do not extend welded wire fabric through expansion joints and isolation joints. Cut alternate wires where fabric crosses control joints. Unless otherwise dimensioned, place welded wire fabric:
  - 1. 2" down from top of slab for slabs on grade.
  - 2. 2" down from top of slab in elevated (framed) & mezzanine slabs 6" or thicker.
- E. In 5.7.5 (templates for column dowels), DELETE "unless otherwise permitted".
- F. In 5.7.6 (mechanical connections), REPLACE "when accepted" with "as specified".

**END OF SECTION 032000**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
  - 4. Suspended slabs.
  - 5. Concrete toppings.
  - 6. Concrete fill for metal pan stairs and bollards.
  - 7. Building frame members.
  - 8. Underslab vapor retarder.
  - 9. Building walls.
  - 10. Insulation.

## 1.03 REFERENCES

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI 305R - Guide to Hot Weather Concreting; 2010.
- E. ACI 306R - Guide to Cold Weather Concreting; 2016.
- F. ACI 308R - Guide to External Curing of Concrete; 2016.
- G. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- I. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2019.
- J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- K. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

- N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- O. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.
- P. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.
- Q. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2019a.
- R. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- S. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- T. ASTM D6817/D6817M - Standard Specification for Rigid Cellular Polystyrene Geofoam; 2017.
- U. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- V. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2018.
- W. PS 1 - Structural Plywood; 2009.
- X. ACI 350 - Concrete Sanitary Engineering Structures.
- Y. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

#### 1.04 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### 1.05 ACTION SUBMITTALS

- A. The contractor shall comply with the requirements of Division 01 Specification of the Project Manual, Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product indicated.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
  - 2. Submit mix design mixtures for each type of concrete to be used on the Project at least 30 calendar days prior to the first scheduled concrete pour. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with ACI 301 and these specifications. The costs associated with development of the design mix and testing of samples shall be included in the bid price.
  - 3. Submit the following:
    - a. Name, address, and telephone number of Contractor's laboratory.
    - b. Mix proportions.
    - c. Source of cement, type, brand, and certified copies of mill reports, including physical and chemical analysis.



- d. Sources of fine aggregates and results of test made in accordance with ASTM C33/C33M and ASTM C40.
  - e. Source of coarse aggregates and results of tests made in accordance with ASTM C33/C33M.
  - f. Catalog cuts of all admixtures.
  - g. Furnish test results of slump, air entrainment and water-cement ratio for each mix design.
4. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens to the laboratory in accordance with ASTM C192/C192M. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
  5. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
  6. If adopted mix fails to produce concrete meeting the requirements for strength and placibility, the Architect may order additional cement or adjustments to mix proportions at no extra cost to the Owner.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, spacing, locations, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement including steel bars and wire fabric.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the state where the project is located; detailing fabrication, assembly, and support of formwork. Shop drawings shall bear the signature and seal of the same licensed Professional Engineer.
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal
  2. Shop drawings shall indicate formwork dimensioning, materials and arrangement of joints and ties.
  3. Manufacturer's instructions: Indicate installation procedure and interface required with adjacent work
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect, if not shown on the drawings.
- G. Samples: For waterstops and vapor retarder.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, provided by manufacturers:
1. Cementitious materials.
  2. Admixtures.
  3. Form materials and form-release agents.
  4. Steel reinforcement and accessories.
  5. Curing compounds.
  6. Bonding agents.
  7. Adhesives and Vapor retarders.
  8. Semi rigid joint filler.

- 9. Joint-filler strips.
- 10. Repair materials.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.
- G. Furnish transit-mix delivery slips to Owner's Representative.

#### 1.07 QUALITY ASSURANCE

- A. Comply with Referenced Standards specified in Division 01 Section "References" in addition to ACI 301.
- B. Perform testing under the provisions of Division 01 Section "Quality Requirements" and the "FIELD QUALITY CONTROL" Article of Part 3 listed in this specification.
- C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
  - 1. The contractor shall provide an adequately sized, insulated curing box to house concrete cylinders at the discretion of the Architect, for the 48-hour period between concrete pour and sample collection pick-up by the Testing Laboratory (ASTM C31/C31M). As directed by the Architect, the contractor shall cure additional cylinders in the same fashion as the in-place concrete.
  - 2. Curing box shall be located away from the main construction area and shall be blocked up off the ground.
  - 3. A log sheet shall be provided in a waterproof sheet protector to log in the placement and removal of the concrete test samples by the testing laboratory.
  - 4. Minimum information to be logged for each pour date shall include: date of pour, date of pick-up, weather conditions at the time of pour, testing
- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. To further insure consistency, coloration, finish and quality; all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the project.
  - 1. The batching plant and raw materials may be subject to inspections and test performed by the Architect.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

- H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specifications for Structural Concrete", Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
  - 3. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
- I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- J. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.
  - 2. Review special inspection and testing and inspecting agency procedures for field quality control, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of water.
- C. Transport dry concrete batches from the central plant to the site in approved truck mixers conforming to the requirements of the Truck Mixer Manufacturer's Agitating Standards. Each truck shall contain a plate stating the capacity, drum speeds and be provided with a revolution counter.
- D. Packaged material shall be delivered and stored in the original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected.
- E. Protect all materials from freezing.

#### 1.09 COORDINATION

- A. Coordinate work under provisions of Division 01 Specification of this Project Manual.
- B. The Contractor shall provide at least five (5) working days advance notice prior to formwork closure to the Architect.
- C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Notify Architect a minimum of three (3) working days prior to commencement concrete pours.

### 1.10 REGULATORY REQUIREMENTS

- A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

### 1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when the ambient temperature is below 40 deg. F. or when the concrete temperature exceeds 85 deg. F. Under certain circumstances, the Engineer may approve the placement of concrete under the above conditions, provided that the procedures of ACI 305R and ACI 306R are strictly adhered to.
- B. Do not place concrete when the conditions may adversely affect the placing, curing or finishing of concrete, or its strength.
- C. Comply with the requirements contained in Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.

## PART 2 - PRODUCTS

### 2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Plywood, metal, or other approved panel materials.
  - 2. Steel forms: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
  - 3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. Douglas Fir Species, solid one side grade and sound
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum unless indicated otherwise on the drawings.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal. Patterns and sizes as shown on the drawings.
- E. Form-Release Agent: Commercially formulated, colorless, water based, non-toxic, V.O.C. compliant, environmentally safe material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by DAYTON SUPERIOR or equal. Agent shall not be detrimental to the environment.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

## 2.02 PERMANENT PREFABRICATED EPS FOAM PANEL FORMWORK

## A. Manufacturers:

1. LiteForm Technologies, LLC; LiteDeck WRS: [www.liteform.com](http://www.liteform.com).
2. b-foam GEOFOAM-GRADE EPS: PT BETON WORKS: [www.b-foam.com/geofoam](http://www.b-foam.com/geofoam).
3. Insulfoam GF (Geofoam)
4. Engineer approved equivalent.

- B. Floor Deck Forms: Pre-engineered expanded polystyrene foam plastic blocks in sizes and shapes required to infill the irregularly shaped areas indicated and verified by the contractor by field measurements. Shop drawings shall be produced based upon field verifications. Forms shall be installed to allow for the installation of a poured reinforced concrete slab as indicated on the drawings. EPS foam shall be Fire-retardant (FR) and shall conform to ASTM D6817/D6817MASTM D6817. EPS foam shall have the following Physical characteristics:

| TYPE                               | EPS12 | EPS15 | EPS19 | EPS 22 | EPS29 | EPS39 | EPS46 |
|------------------------------------|-------|-------|-------|--------|-------|-------|-------|
| Density, min. pcf                  | 0.70  | 0.90  | 1.15  | 1.35   | 1.80  | 2.40  | 2.85  |
| Compressive Resistance at 1%, psi  | 2.2   | 3.6   | 5.8   | 7.3    | 10.9  | 15.0  | 18.6  |
| Compressive Resistance at 5%, psi  | 5.1   | 8.0   | 13.1  | 16.7   | 24.7  | 35.0  | 43.5  |
| Compressive Resistance at 10%, psi | 5.8   | 10.2  | 16.0  | 19.6   | 29.0  | 40.0  | 50.0  |
| Flexural strength min., psi        | 10.0  | 25.0  | 30.0  | 30.0   | 50.0  | 60.0  | 75.0  |
| Elastic Modulus (min.), psi        | 220   | 360   | 580   | 730    | 1090  | 1500  | 1860  |

## C. Expanded Polystyrene (EPS) Insulation Board: ASTM C578, Type VIII.

1. Density: See chart above.
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
4. Oxygen Index, Volume %: 24.0 min.
5. Dimensional Stability, maximum %: <2%.
6. Poisson's Ratio: 0.05.
7. Coefficient of Friction: 0.6
8. Absorption, volume %: <4.0%

## 2.03 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- C. Galvanized Reinforcing Bars: ASTM A615/A615M, Grade 60; ASTM A706/A706M, deformed bars; ASTM A767/A767M, Class II zinc coated after fabrication and bending.
- D. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.
- E. Deformed-Steel Wire: ASTM A 496.

- F. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

#### 2.04 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.
- D. Mechanical Splicing Systems: Components for field splices using taper threaded splices designed for use with specified grades of reinforcing to facilitate standard bar-to-bar connections, pre-caging applications, hooked bar applications, closure pours, precast connections, rebar terminations and anchorages, transition splices, segmental construction and connections to structural steel.
  - 1. Manufacturer:
    - a. nVent LENTON
    - b. Engineer approved equivalent.
  - 2. Systems:
    - a. Taper Threaded Splicing Systems: Standard Couplers, Standard Transition Couplers, Position Couplers, Position Transition Couplers, Form Saver Couplers, Weldable Couplers, Parallel Bolt Couplers, Special Couplers, and Assemblies and Accessories for complete assemblies.
      - 1) Provide Electrostatically Epoxy coated couplers for corrosion protection.
      - 2) Sizes: #3 through #18.
    - b. Mechanical Anchors: Terminators, Future Extension Terminators, Form Saver Anchors, Form Saver with Large Anchor - D6SA, Anchors with Extensions, and D6 anchor with Male Bar, One Piece
      - 1) Sizes: #4 through #11.
    - c. Ultimate Splicing Systems and Mechanical Anchors: MT12 Male Taper-Threaded Stud, FT12 Standard Coupler, MS15 Male Straight-Threaded Stud, PT15 Position Coupler, DR14 Mechanical Anchor, and DR16 Mechanical Anchor
    - d. Interlok Grout-Filled Precast Splicing System and Accessories.
      - 1) Sizes: #6 through #18.
    - e. Quick Wedge Mechanical Lap System: Quick Wedge Couplers and Pins.
      - 1) Sizes: #4 through #6.
    - f. Speed Sleeve Compression-Only Splices: Speed Sleeve Coupler, Speed Sleeve Transition Adaptor, and Speed Sleeve Installation Ratchet.
      - 1) Sizes: #6 through #18.
    - g. Cadweld Metal-Filled Splicing System: Splice Kits, Filler Material Kits and Components, and Installation Equipment Kits and Components.

- 1) Sizes: #4 through #18.
- h. Connect Shear Bolt Splicing System: Connect S2 Series Shear Bolt Coupler, Plain, Connect S2 Series Shear Bolt Coupler, Epoxy, Connect B12 Series Shear Bolt Coupler, Plain, and Connect B12 Shear Bolt Coupler, Epoxy
- i. Lock: No bar preparation required, develops full strength of connected reinforcing. Less than 0.0039 inch slip.

## 2.05 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  1. Portland Cement: ASTM C150/C150M, Type IA, gray. Supplement with the following:
    - a. Fly Ash: ASTM C618, Class F or C.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
  2. Silica Fume: ASTM C1240, amorphous silica.
  3. Normal-Weight Aggregates: ASTM C33/C33M, No. 57 or 67 crushed stone coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
    - a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
    - b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
  4. Lightweight Aggregate: ASTM C330/C330M, 3/4 inch, nominal maximum aggregate size.
  5. Water: ASTM C94/C94M, clean and not detrimental to concrete.

## 2.06 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  2. Retarding Admixture: ASTM C494/C494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

## 2.07 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E1745, Class C or polyethylene sheet, ASTM D4397 not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400
    - b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120
    - c. Insulation Solutions, Inc.; Viper VaporCheck 10.
    - d. Meadows, W. R., Inc.; Perminator 10 mil.
    - e. Reef Industries, Inc.; Griffolyn 10 mil Green.
    - f. Stego Industries, LLC; Stego Wrap 10 mil Class A.
    - g. Or approved equal.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33/C33M for fine aggregates.

## 2.08 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dayton Superior Corporation; Emery Tuff Non-Slip
    - b. Lambert Corporation; EMAG-20
    - c. L&M Construction Chemicals, Inc.; Grip It
    - d. Metalcrete Industries; Metco Anti-Skid Aggregate

## 2.09 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz. /sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet weighing approximately 8 oz. / sq. yd. bonded to prevent separation during use.
- C. Membrane curing compound: Moisture Retention complying with ASTM C309. Products: EUCOCURE VOX by Euclid Chemical Company or equal.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
  - 1. Products: Eucocure VOX as manufactured by Euclid Chemical Company or approved equal.

## 2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, 1/2" asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: three-component, solvent-free, moisture tolerant, epoxy modified cementitious product.
  - 1. Product: Armatec 110 EpoCem as manufactured by Sika Corporation or specifically approved equal.
  - 2. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Non-Shrink Grout: Premixed compound, free of chlorides, with non-metallic aggregate, cement water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi at 48 hours and 7000 psi at 28 days. Grout shall be suitable for contact with potable water. For equipment bases and pipe supports, use non-shrink grout by Master Builders, Embeco 636, Unisorb V-1 or equal.
- E. Reglets: Fabricate reglets of galvanized-steel sheet not less than 26 gauge material; in the longest lengths possible with alignment splines for joints; secure to formwork; Type CO as manufactured by Fry Reglet or approved equal. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.



- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inches (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- G. Extrudable Strip Waterstop: One part polyurethane, extrudable swelling waterstop to create a compression seal; SikaSwell S-2 as manufactured by Sika Corp. or specifically approved equal.
- H. Field Applied Waterstop Grout: Krystol Waterstop Grout, crystalline grout to be applied in accordance with the manufacturer's specifications at joints and penetrations. Manufacturer: Kryton International Inc. (800)267-8280 or approved equal.

## 2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C150/C150M, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C109/C109M.

## 2.12 PARGING

- A. Parge exterior faces of above-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a beveled return concealed at the bottom edge.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

## 2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
  - 2. Combined Fly Ash and Pozzolan: 25 percent.
  - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
  - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or Pozzolan not exceeding 25 percent.
  - 5. Silica Fume: 10 percent.
  - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
  8. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use plasticizing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

#### 2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Pier, Mat and Spread Footings; foundation walls, slab on grade and slab on metal deck: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.50 for all concrete building elements.
  3. Slump Limits (Conventional Mix):
    - a. Slabs: 3 inches plus or minus one inch.
    - b. Piers, Foundation Walls and Footings: 4 inches plus or minus one inch.
  4. Slump Limits (Pump Mix):
    - a. Final slump (Slabs): 6 1/2 inches plus or minus one inch.
    - b. Final Slump (Foundation, walls and footings): 7 1/2 inches plus or minus one inch
  5. Air Content:
    - a. Piers, Mats and Spread Footings: 5.5 percent, plus or minus 1.0 percent. at the point of delivery.
    - b. Slabs: 3 percent, plus or minus 1.0 percent at point of delivery. Do not allow air content of trowel finished concrete floors to exceed 3 percent.
  6. Large Aggregates: 3/4" crushed stone; ASTM C33/C33M, No. 67.
  7. Use Admixtures only when approved by the Engineer.
  8. Mix Grout in accordance with the manufacturer's instructions and specifications.

#### 2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

#### 2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify lines, levels, and measurements before proceeding with formwork. Ensure that dimensions agree with the plans.
- B. Inspect the formwork and reinforcing that it has been properly set and secured and that all items to be embedded, built-in or pass through concrete are at their proper locations and elevations.
- C. The General Construction Contractor shall verify that all other prime contractors have installed concrete inserts, sleeves, and embedded elements of the project, such as conduit, and their work has been totally completed and inspected by the Architect.
- D. Ensure that all points of contact with new grout are free from oil, grease and scale.

### 3.02 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  1. Class A, 1/8 inch for smooth-formed finished surfaces.
  2. Class B, 1/4 inch for rough-formed finished surfaces.
    - a. Hand trim sides and bottom of earth forms and remove loose soil to the satisfaction of the Architect.
    - b. Remove water from forms and excavations and divert water flow to avoid washing over, under or through freshly placed concrete.
- D. Construct forms tight enough to prevent loss of concrete mortar. Align form joints.
- E. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  1. Install keyways, reglets, recesses, and the like, for easy removal.
  2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- I. Chamfer: Provide 3/4" inch chamfer on all exterior horizontal and vertical corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- N. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-metallic/ non-shrink grout.
- O. Prepare previously placed concrete by cleaning with steel brush and apply a Bonding Agent in accordance with the manufacturer's specifications and instructions.

### 3.03 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
  - 3. Install dovetail anchor slots in concrete structures as indicated.
  - 4. Ensure that all inserts and embedded items are not disturbed during concrete placement.

### 3.04 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.05 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

### 3.06 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturers recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

### 3.07 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Use reinforcing splices at minimum of locations and only at locations of minimum stress. Review locations of splices with Architect. Splice locations shall be approved during shop drawing review phase. Rebar splice overlap shall be the minimum length as per ACI 318.
  - 1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Take necessary measures to ensure that reinforcement is not disturbed during the placement of concrete.

### 3.08 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
  3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  5. Space vertical joints in walls as indicated or at 20' o.c. maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction / Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16"-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 - JOINT SEALANTS are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- F. Ensure joint fillers and devices are not disturbed during placement of concrete.
- G. Install all joint fillers and devices in accordance with the manufacturer's instructions and specifications for floor and wall finish.
- H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.
- I. Install joint covers in one-piece length when adjacent construction activity is complete.
- J. Apply sealants in joint devices in accordance with the manufacturer's specifications and instructions.

### 3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
  - 2. Place concrete with the aid of mechanical vibrators which are capable of transmitting to the concrete not less than 3,000 impulses per minute. Maintain at least three (3) vibrators in good working condition, ready for use when concrete placement begins in any one area.
  - 3. Do not interrupt successive placement. Do not permit cold joints to occur.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:
  - 1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
  - 3. Maintain records of concrete placement. Record date, locations, quantity, air temperature and test samples taken.

4. In areas with floor drains, maintain floor elevations at walls; pitch surfaces uniformly to the drains maintaining a 1% slope.
5. Cure floor surfaces in accordance with ACI 308R.
6. Apply curing compound in accordance with the manufacturer's specifications and instructions in two (2) coats with the second coat at right angles to the first.

### 3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
  1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch 6 mm in one direction.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
  1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:



- a. Specified overall values of flatness, F (F) 30; and of levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and of levelness, F (L) 15; for suspended slabs.
- 3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. This surface shall be used for interior and exterior walking surfaces unless noted otherwise. Finish edges of exterior walkway flags with steel tooled radius edge.
  - 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, equipment pads, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
  - 1. Uniformly spread 25 lb. /100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
  - 2. After broadcasting and tamping, apply float finish.
  - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

### 3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. All exposed horizontal and vertical wall and slab corners shall have a 3/4" wide chamfered edge.
- D. Equipment Bases and Foundations:
  - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  - 2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
  - 3. Minimum Compressive Strength: 4000 psi at 28 days.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 12 inch centers around the full perimeter of concrete base.
  - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
  - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 7. Cast anchor-bolt inserts into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

- E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.
- F. Grout: Install grout in accordance with the manufacturer's specifications and instructions. Moisten concrete and grout surfaces and allow drying until damp. Remove all standing water. Pump or inject grout into tight spaces to ensure intimate contact with the existing grout. Cure grout with an appropriate membrane in accordance with the manufacturer's specifications and instructions.

### 3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308R and ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound

manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

- F. Liquid sealer/hardener to be applied on exposed concrete cured with moisture retentive or absorptive covers. The following materials provide varying levels of protection, sealant and hardness. Review products for project appropriateness.
  - 1. Euclid: Euco Diamond Hard (Liquid Sealer and Hardener)
  - 2. L&M Construction Chemicals: Seal Hard (Liquid Sealer and Hardener)
  - 3. Curecrete Chemical Company: Ashford Formula (Liquid Sealer and Hardener)
  - 4. Midwest Floor Care: Structure Formula (Liquid Sealer and Hardener)
  - 5. Or approved equal.

### 3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Immediately remove all rust spots that have developed during the construction period as soon as directed by the Architect. Remove all rust spots that have formed by the use of temporary handrails.

### 3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor is responsible to notify the Owners representative at least 72 hours prior to the scheduled work that requires inspection / testing. The presence of the Inspector engaged by the Owner does not relieve the contractor of Quality Control Requirements.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
  - 1. Steel reinforcement placement.
  - 2. Headed bolts and studs.
  - 3. Steel reinforcement welding.
  - 4. Concrete placement, including conveying and depositing.
  - 5. Curing procedures and maintenance of curing temperature.
  - 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  - a. Frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - b. One (1) additional test cylinder shall be taken during cold weather and be cured under the same conditions as the concrete it represents.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M.
  - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
  - b. Cast and field cure two Insert number sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
  - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
  - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

- E. Measure floor and slab flatness and levelness according to ASTM E1155 within 72 hours of finishing.

**END OF SECTION 033000**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.
- B. Section 031000 - Concrete Forming and Accessories.
- C. Section 033000 - Cast-In-Place Concrete.

## 1.02 SCOPE

- A. Finishing slabs on grade, elevated slabs and monolithic floor slabs.
- B. Finishing exposed concrete interior and exterior walls (Formed Surfaces).
- C. Testing for floor flatness.
- D. Repair of defective concrete.
- E. Surface treatment with concrete hardener and sealer.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards, manufacturer's recommendations and the ACI Manual of Concrete Practice.
- B. ACI 301 "Specifications for Structural Concrete for Buildings".
- C. ACI 302.1R "Guide for Concrete Floor and Slab Construction"
- D. ACI 303 "Guide to Cast-In-Place Architectural Concrete Practice".
- E. ASTM E1155 "Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data: Submit manufacturer's product data for each type of concrete sealer, clearly indicating locations each type of sealer will be used.
- D. Samples: Provide two (2) 6" x 6" x 2" concrete samples, fully cured, with 2 coats of the proposed exposed interior concrete wall sealer applied for approval by the Architect.

## 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations, ACI 301 and industry standards.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.

- B. Protect against moisture exposure and damage.

## PART 2 PRODUCTS

### 2.01 CONCRETE SEALER

- A. Exterior Concrete
  - 1. AQUAPEL from L&M Construction Chemicals, a product brand of Laticrete International or Architect approved equivalent.
  - 2. Apply to all exterior concrete pavement, slabs, stoops, aprons, sidewalks and patios.
  - 3. Handle and apply according to manufacturer's recommendations.
  - 4. Apply sealer to slabs that are a minimum of 28 days old, have been thoroughly moist cured and have been allowed to air dry.
- B. Exposed Interior Concrete Slabs and Stair Treads
  - 1. Seal Hard from L&M Construction Chemicals, a product brand of Laticrete International or Architect approved equivalent.
  - 2. Seal all exposed interior concrete flat surfaces as indicated on the Room Finish Schedule or elsewhere as shown on the Contract Drawings.
  - 3. Apply two coats in accordance with manufacturer's recommendations.

## PART 3 EXECUTION

### 3.01 FINISHING UNFORMED SURFACES (SLABS)

- A. Scratched Finish:
  - 1. After placing, consolidating, and striking-off slabs, level surface to a tolerance not exceeding 1/8 in. in 2 ft when tested with a 2 ft straight edge. Slope surfaces uniformly to drains.
  - 2. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
  - 3. A 2' x 2' area of concrete shall be prepared and finished as a sample for the Owner and Architect to approve the finish and roughness.
- B. Troweled Finish: (Non-Bay Areas, rooms to receive tile or carpet)
  - 1. After floating, steel-trowel slab surface to a smooth, even, impervious finish free from trowel marks. Grind smooth surface defect which would telegraph through applied floor covering system.
- C. Slip Broom Finish: (Exterior Concrete)
  - 1. After placing, consolidating, and striking-off slabs, level surface to a tolerance not exceeding 1/8 in. in 2 ft when tested with a 2 ft straightedge. Slope surfaces uniformly to drain. Do not work surface until ready for floating.
  - 2. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft when tested with a 10 ft straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
  - 3. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom in straight, parallel lines perpendicular to main traffic route. Coordinate required final finish with the Architect before application.
- D. Caution: Do not use jitterbugs at any time.

## 3.02 FINISHING FORMED SURFACES (INTERIOR &amp; EXTERIOR)

- A. Exposed to view surfaces: Patch all form tie holes and rub to produce a smooth, uniform finish. Patching material to match concrete in color and texture.

## 3.03 TOLERANCES (INTERIOR SLABS)

- A. An independent testing agency, as specified in Section 014523 - Testing and Inspection Services, will inspect finished slabs for flatness.
- B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 72 hours after slab installation.
- C. Finish concrete to achieve the following tolerances:
  - 1. Exposed to View and Foot Traffic: F(F) 20 and F(L) 15.
  - 2. Slabs to be Covered with Thin Floor Coverings (i.e., resilient flooring, ceramic flooring): Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.
  - 3. Slabs to be Covered with Wood Flooring: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.
  - 4. Slabs to be Covered with Carpet, Carpet Tile, Rubber Flooring and Other Slabs: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 20; with minimum values of flatness, F(F) 17; and of levelness, F(L) 15.
  - 5. The F(L) values listed above are not applicable to elevated slab on deck. Only F(F) values apply to elevated slabs.
- D. Correct the slab surface if tolerances are less than specified.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process. Costs for re-measurement testing will be borne by the Contractor.

## 3.04 REPAIR OF DEFECTIVE WORK

- A. Repair of Unformed Surfaces (Slabs): Test unformed surfaces, such as monolithic slabs, for smoothness and to verify that surface planes conform to tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
  - 1. Repair finished unformed surfaces that contain defects which adversely affect durability of concrete. Surface defects include crazing, cracks in excess of 0.01 in. wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
  - 2. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 in. clearance all around.
    - a. Dampen concrete surfaces in contact with patching concrete and apply specified bonding compound. Place patching concrete after bonding compound has dried. Mix patching of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  - 3. Repair isolated random cracks and single holes not over 1 in. in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles.



4. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
  5. Correct low areas in unformed surfaces during, or immediately after completion of, surface finishing operations by cutting out low areas and replacing with fresh concrete if floor is exposed or self-leveling cement-based product approved by the Architect. Self-leveling product used must be compatible with all types of finished flooring being used. Finish repaired areas to blend into adjacent concrete. Use specified bonding or patching compound.
- B. Make structural repairs with prior approval of Architect as to method and procedures, using structural patching mortar.

### 3.05 SEALER APPLICATION

- A. Clean concrete of all dirt, laitance, contaminants, oil, existing coatings or membrane curing compounds before application.
- B. Install sealers in accordance with manufacturer's written instructions and recommendations.
- C. On vertical surfaces, apply sealer evenly and uniformly to avoid streaking. Streaking in sealer coating is not acceptable.

**END OF SECTION 033500**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SCOPE

- A. This Section includes grouting of the following:
  - 1. Base plates, leveling plates, bearing plates and sleeves.
  - 2. Concrete masonry unit (CMU) cores where specified or shown on Contract Drawings.
  - 3. Concrete masonry unit (CMU) cores where other items are attached or secured to CMU whether indicated on Contract Drawings or not.
  - 4. Concrete masonry bond beams.
  - 5. Hollow metal door frames located in concrete, precast and/or CMU walls.
  - 6. Other miscellaneous grouting as shown on Contract Drawings or required by individual specifications.
  - 7. Epoxy grout where specified on Contract Drawings.
  - 8. Adhesive type epoxy grout for dowel and/or fastener anchorage.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 034113 - Precast Concrete Hollow Core Planks for grouting of planks and attachments to hollow core plank.
  - 2. Section 042200.11 - Reinforced Unit Masonry
  - 3. Section 051200 - Structural Steel Framing
  - 4. Section 055000- Metal Fabrications
  - 5. Section 055100 - Metal Stairs, Handrails and Railings
  - 6. Section 055213 - Aluminum Pipe and Tube Railings

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM C33 - "Standard Specification for Concrete Aggregates".
- C. ASTM C109 - "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or [50 mm] Cube Specimens)".
- D. ASTM C150 - "Standard Specification for Portland Cement".
- E. ASTM C476 - "Standard Specification for Grout for Masonry".
- F. ASTM C494 - "Standard Specification for Chemical Admixtures for Concrete".
- G. ASTM C579 - "Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes".
- H. ASTM C827 - "Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures".
- I. ASTM C1107 - "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)".

#### 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Manufacturer's product data for pre-mixed non-shrink grout, flowable epoxy grouts, and adhesive type epoxy grouts or resins.
- D. Submit mix designs with test reports for all field mixed or ready mix supplied grouts. Provide source reports for all grout components i.e. cement, sand, admixtures (if any), water and any other ingredients.
- E. Certificates of Compliance for all grout products used on the project.

#### 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.
- B. Manufacturer of pre-packaged grouts and adhesives shall have been in business of manufacturing this or similar products for over fifteen (15) years, maintain a strict quality assurance program, offer technical services and provide a representative at the jobsite for product training, prior to product installation, upon written request.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Manufactured products shall be delivered to the jobsite in their original, unopened packages, clearly labeled with the manufacturer's identification, printed instructions, batch code, and shelf life dates.
- B. Grout delivered in concrete mixer trucks shall be discharged within 120 minutes of end of batch time at the plant.
- C. Pursuant to manufacturer's published instructions.
- D. Protect against moisture exposure and damage.

### PART 2 PRODUCTS

#### 2.01 NON-METALLIC, NON-SHRINK GROUT

- A. Description: Premixed, non-staining, non-gassing grout, requiring only the adding of water, suitable for use as plastic, flowable, or fluid mix with no shrinkage in either the plastic or the hardened state.
  - 1. Compressive strength at 28 days, from flowable mix: pass ASTM C109; 5000 lb./sq. in. minimum.
  - 2. Volume change from plastic to hardened state: pass ASTM C827; -0%, to +2% maximum.
- B. Manufacturers:
  - 1. Euclid NS Grout, by The Euclid Chemical Company.
  - 2. Five Star® Grout, by Five Star Products, Inc.
  - 3. MasterFlow 885 by Master Builders.
  - 4. Architect approved equivalent.

## 2.02 EPOXY GROUT

- A. Description: Premixed, packaged, multi-component, all-purpose flowable grout.
  - 1. Compressive strength at 7 days: 12,000 lbs./sq.in. minimum.
- B. Manufacturers:
  - 1. E3-Flowable, by The Euclid Chemical Company.
  - 2. Five Star® Fluid Epoxy, by Five Star Products, Inc.
  - 3. EG-96 HP, by W.R. Meadows, Inc.
  - 4. Architect approved equivalent.

## 2.03 GROUT FOR CONCRETE UNIT MASONRY

- A. Cement: Portland cement shall be ASTM C150 Type I or Type II, containing less than 0.6 percent alkali.
- B. Aggregate:
  - 1. General: Aggregate shall be non reactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the material from the new source prior to commencing grout work.
  - 2. Fine Aggregate: Fine aggregate shall be washed natural sand conforming to ASTM C33 Fine Aggregate Spec.
    - a. Use fine grout for spaces up to 1 1/2" wide or to fill cells up to 4" in size.
  - 3. Coarse Aggregate (Coarse grout only): Washed crushed stone conforming to the gradation requirements of ASTM C33 Size No. 8 (3/8" to No. 8).
    - a. Use coarse grout only to fill cells having larger dimensions.
- C. Admixtures:
  - 1. Water Reducing Retarder: Water reducing retarder shall comply with ASTM C494, Type D.
- D. Water:
  - 1. Water for mixing and curing shall be potable, shall not contain more than 1000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO<sub>4</sub>, and shall not contain impurities which may change the setting time by more than 25 percent or a reduction of more than 5 percent of the compressive strength of the grout at 14 days when compared to the results for grout made with distilled water.
- E. Compressive strength at 28 days: 3,000 psi.
- F. Mix Ratio:
  - 1. 1 part Portland cement
  - 2. 0.1 part hydrated lime or lime putty
  - 3. Aggregate as follows:
    - a. For fine grout, use fine aggregate in a volume of 2.2 to 3.0 times the sum of the volumes of the cementitious materials.
    - b. For a coarse grout with fine aggregate, use aggregate in a volume of 2.25 to 3.0 times the sum of the volumes of the cementitious materials.
    - c. For a coarse grout with coarse aggregate, use aggregate in a volume of 1 to 2 times the sum of the volumes of the cementitious materials.
    - d. Maintain a slump of 8 to 10 inches.

## 2.04 ADHESIVE RESIN FOR DOWEL OR FASTENER ANCHORAGE

- A. ICC approved, structural epoxy; prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed thru the nozzle.

1. Hilti HIT-HY 200-R Adhesive Anchoring System.
2. Hilti HIT-RE500 V3 Injectable Epoxy Mortar.
3. Architect approved equivalent.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Verify packaged grout, epoxy grout and resin adhesives are within their shelf life limits.
- B. Prepare surfaces, install non-shrink and/or epoxy grout, and cure pursuant to manufacturer's recommendations.
- C. Holes required for grouting or adhesive resin application shall be; brushed clean; blown clean with compressed air and are to be free of dust and/or water.
- D. Install grout in driest, stiffest possible mix, pursuant to manufacturer's published mixing instructions, that will assure filling of voids. Fill space between structural support member and bearing structure and work the grout so as to assure full contact and no voids. Trim and seal exposed edges.
- E. Install adhesive resin in accordance with manufacturer's instructions. Verify components are within expiration dates.

### 3.02 FIELD QUALITY CONTROL

- A. Owner will engage the services of an independent testing agency to perform special inspections of all grout placement and random compressive strength testing of grout in accordance with the Special Inspection requirements.

**END OF SECTION 036000**

## PART 1 GENERAL

## 1.01 RELATED SECTIONS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes mortar for all concrete unit masonry, ACMU masonry, brick masonry, glass unit masonry, cast stone, precast concrete units, and adhered masonry units.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 034500 - Precast Architectural Concrete
  - 2. Section 036000 - Grouting
  - 3. Section 040523 - Masonry Accessories
  - 4. Section 042113 - Brick Masonry
  - 5. Section 042200 - Concrete Unit Masonry
  - 6. Section 042200.11 - Reinforced Unit Masonry
  - 7. Section 047200 - Cast Stone
  - 8. Section 079200 - Sealants

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendation.
- B. ASTM C91 "Standard Specifications for Masonry Cement".
- C. ASTM C109 "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars".
- D. ASTM C144 "Standard Specification for Aggregate for Masonry Mortar".
- E. ASTM C150 "Standard Specification for Portland Cement".
- F. ASTM C207 "Standard Specifications for Hydrated Lime for Masonry Purposes".
- G. ASTM C270 "Standard Specifications for Mortar for Unit Masonry".
- H. ASTM C780 "Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry".
- I. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete".
- J. ASTM C1506 "Standard Test method for Water Retention of Hydraulic Cement-Based Mortars and Plasters".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Submit certificates of compliance and manufacturer's technical data describing: cement, lime, sand and admixture products specified.

- D. Submit manufacturer's technical data describing integral coloring specified.
- E. Submit small mortar samples depicting integral coloring. Provide manufacturer's entire range of available colors. Plastic samples representing available colors are not acceptable.
- F. Mortar mix designs for each type of mortar. Include description of type and proportions of ingredients.
  - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
- G. Submit results of tests of field specimens.

#### 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.

### PART 2 PRODUCTS

#### 2.01 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I or Type II.
  - 1. Provide white cement for integral coloring where required to obtain desired mortar color.
- B. Sand: ASTM C144; local mason sand.
- C. Water: Clean, potable and salt free.
- D. Lime: ASTM C207, Type S mortar.
- E. Provide all cement products from one manufacturer.

#### 2.02 ADMIXTURES

- A. Admixtures containing calcium chlorides are prohibited.
- B. All mortar for exterior concrete masonry applications shall contain an integral water-repellent admixture such as:
  - 1. BLOCKTITE Mortar Admixture by Euclid Chemical Company.
  - 2. DRY-BLOCK® System by GCP Applied Technologies, Inc.
  - 3. MasterPel® 210E by Master® Builders Solutions.
- C. Mortar water-repellent admixture shall be same water-repellent admixture used in the manufacture of the concrete masonry units.
- D. Apply at dosage recommended by the manufacturer.
- E. Do not use integral water repellent mortar admixture with clay masonry applications.

## 2.03 INTEGRAL COLORING

- A. Product: dry mixture of pure, non-fading, alkali-resistant iron-oxide pigments possessing uniform dispersion characteristics specifically intended for mixing into mortar and complying with ASTM C979.
- B. Color selection by Architect.

## 2.04 MORTAR MIX

- A. Prepare mortar mixes pursuant to "Property Specification Requirements" of ASTM C270 for types indicated on Drawings and herein specified. Do not exceed manufacturer's recommended pigment to cement ratio in colored mortar.
- B. Exterior Concrete Unit Masonry (above grade) and cast stone sills
  - 1. Mortar:
    - a. Type S (minimum average compressive strength at 28 days: 1,800 lb./sq. in.).
    - b. Mix: Portland cement/lime/sand.
    - c. Portland cement Type I or II except Type III may be used for cold weather construction.
  - 2. Admixture:
    - a. Coloring pigments, color as selected by Architect.
    - b. Must contain admixture for waterproofing
      - 1) Submittals must specify water repellent agent.
      - 2) Submit product literature for approval prior to using mortar on any finished area.
- C. Exterior Brick Masonry (above grade)
  - 1. Mortar:
    - a. Type N
      - 1) Proportion Portland cement, Lime and Sand in a 1:1:6 ratio
  - 2. Admixture:
    - a. Coloring pigments, color as selected by Architect.
    - b. Submit product literature for approval prior to using mortar on any finished area
- D. Interior Concrete Unit Masonry
  - 1. Mortar:
    - a. Type S (minimum average compressive strength at 28 days: 1,800 lb./sq. in.).
    - b. Mix: Portland cement/lime/sand.
    - c. Color: Standard gray
      - 1) Standard gray at CMU to be painted.
- E. Tests
  - 1. Prepare mix designs and conduct tests using a recognized laboratory.

## PART 3 EXECUTION

## 3.01 MIXING

- A. Mix mortar by methods that will ensure accurate proportioning of all required ingredients to a uniform consistency.
- B. Mechanically mix between 3 to 5 min. Hand mixing is prohibited.
- C. Select ingredients that are compatible.



- D. Do not combine two air entraining materials within same mortar mix.

### 3.02 RETEMPERING

- A. Use mortar within 2-1/2 hours of initial mixing.
- B. Discard unused mortar after it has begun to set. Do not re-temper mortar that has begun to set.

### 3.03 ADMIXTURES

- A. Mix admixtures into mortar pursuant to manufacturer's published instructions.

### 3.04 INTEGRAL COLORING

- A. Provide integral coloring to mortar for all exterior walls and interior ACMU walls if any.
- B. Mix into mortar pursuant to manufacturer's published instructions.

### 3.05 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work area, as needed to perform inspections.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests, inspections and prepare test reports:
  - 1. Payment for these services will be made by Owner.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM 780, testing with same frequency as masonry samples.
  - 1. Test three samples for each 5,000 square feet of wall area or portion thereof; test one sample at 7 days and two samples at 28 days for each set.

**END OF SECTION 040513**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following masonry related items:
  - 1. Metal horizontal joint reinforcement for masonry.
  - 2. Masonry vertical cell reinforcing.
  - 3. Masonry bond beam reinforcing.
  - 4. Wall weep and ventilation for masonry veneer.
  - 5. Masonry veneer anchors.
  - 6. In wall cavity mortar netting with insect barrier.
  - 7. Thru wall flashing.
  - 8. Masonry Control Joints.
  - 9. Masonry Partition Anchors and Z Ties.
  - 10. Grout Screen.
  - 11. Masonry anchorage to steel columns and beams.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 034500 - Precast Architectural Concrete
  - 2. Section 040513 - Mortar.
  - 3. Section 042200 - Concrete Unit Masonry
  - 4. Section 047200 - Cast Stone
  - 5. Section 047113 - Calcium Silicate Manufactured Stone
  - 6. Section 076200 - Sheet Metal Flashing and Trim

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM A82 "Standard Specification for Steel Wire, Plain, for Concrete Reinforcement".
- C. ASTM A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".
- D. ASTM A641 "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire".
- E. ASTM A951 "Standard Specification for Masonry Joint Reinforcing".
- F. ASTM D2287 "Standard Specification for Non-rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds".
- G. "Building Code Requirements and Specification for Masonry Structures" and Companion Commentaries (latest edition) (ACI-530/530.1; ASCE-5; TMS-402/602).
- H. ACI 315R "Guide to Presenting Reinforcing Steel Design Details".

## 1.04 DEFINITIONS

- A. ACMU(s): Architectural concrete masonry unit(s).
- B. CMU(s): Concrete masonry unit(s).

- C. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### 1.05 SUBMITTALS

- A. Submit pursuant to 013300 - Submittal Procedures.
- B. Submit pursuant to 016100 - Product Requirements.
- C. Product Data: Provide manufacturer's cut sheets clearly hi-lighting or otherwise indicating choices in size, gauge, color, material, etc. for the following products:
  - 1. Horizontal joint reinforcing.
  - 2. Veneer anchors.
  - 3. Masonry anchors to structural steel.
  - 4. Movement joint products.
  - 5. Grout screen.
  - 6. Through-wall flashing, drip edge and termination bar.
  - 7. Cell vents.
  - 8. Mortar netting.
  - 9. Rigid ties.
  - 10. Partition top anchors.
  - 11. Expansion and adhesive anchors.
  - 12. Reinforcing steel mill test reports.
- D. Shop Drawings: For the following:
  - 1. Reinforcing Steel; Detailed bending and placement of unit masonry reinforcing bars. Comply with ACI 315R, "Guide to Presenting Reinforcing Steel Design Details".
  - 2. Coordinate masonry vertical reinforcing shop drawings with foundation rebar shop drawings that show vertical dowels into masonry cores.
  - 3. Anchor sections of masonry anchors for connecting to steel columns, steel lintel beams, and steel edge angles.
- E. Submit certificates of compliance and manufacturer's technical data for but not limited to: horizontal joint reinforcing, movement joints products, anchors, thru-wall flashing, mortar netting, wall ventilation and rigid ties.

#### 1.06 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

#### 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.
- C. Store masonry accessories to prevent corrosion and accumulation of dirt, oil or any other foreign substances.

### PART 2 PRODUCTS

#### 2.01 HORIZONTAL JOINT REINFORCEMENT WITH TIES OR ANCHORS

- A. Description: Two or more parallel longitudinal deformed rods, weld connected with transverse cross rods which forms a ladder design.

- B. Provide with out-to-out longitudinal rod spacing two inches less than out-to-out of CMU wythe width.
- C. Exterior Application:
  - 1. Side Rods: Two rods, 3/16-inch diameter.
  - 2. Cross Rods: 9 gauge.
  - 3. Finish: hot dip galvanized 1.5 oz. per sq. ft., ASTM A153, Class B-2.
  - 4. Pintle: super-heavy-duty eyelets, pintles are flattened and serrated.
    - a. Embed pintles (hooks) in the mortar joint and extend into the veneer a minimum of 1 1/2", with at least 1" cover to the outside face.
- D. Products: #270 ML Adjustable Eye-Wire by Hohmann & Barnard, Inc., ([www.h-b.com](http://www.h-b.com)) or Architect approved equivalent.

## 2.02 HORIZONTAL JOINT REINFORCEMENT WITHOUT TIES OR ANCHORS

- A. Description: two or more parallel longitudinal deformed rods weld connected to a continuous diagonally oriented cross rod which forms a "ladder" design.
- B. Provide with out-to-out side rod spacing two in. less than out-to-out total wall system width.
  - 1. Lap side rods minimum of 6" at splices u.o.n.
- C. Exterior Application:
  - 1. Side Rods: 2 min., 3/16-inch diameter.
  - 2. Cross Rods: 9 gauge.
  - 3. Finish: hot dip galvanized 1.5 oz. Per sq. ft., ASTM A153, Class B-2.
- D. Interior Application:
  - 1. Side Rods: 2 min., 3/16-inch diameter.
  - 2. Cross Rods: 9 gauge.
  - 3. Finish: mill galvanized minimum of .10 oz. psf.
- E. Products: #220 Ladder Mesh by Hohmann & Barnard, Inc. ([www.h-b.com](http://www.h-b.com)), or Architect approved equivalent.

## 2.03 VENEER ANCHORING SYSTEM (HB-213)

- A. Description: vertically adjustable mechanical anchoring system for anchoring masonry veneer to metal stud wall construction.
- B. Provide 14-gauge HB-213 with 3/16-inch diameter 2X-Hook as manufactured by Hohmann & Barnard, Inc. or Architect approved equivalent.
  - 1. Embed 2X-Hook in the veneer mortar joint a minimum of 2", with at least 1" cover to the outside face.
- C. Install at wall studs through exterior gypsum wall board.
  - 1. Space mechanical ties at 24" o.c. horizontally and 16" o.c. vertically when wall studs are 24" o.c.
  - 2. Space mechanical ties at 16" o.c. horizontally and 24" o.c. vertically when wall studs are 16" o.c.
  - 3. At openings in veneer (windows, doors, louvers, etc.) that exceed 16" in any direction, place additional mechanical ties around the perimeter of the opening at 36" o.c. maximum and shall be placed within 12" of the perimeter of the opening.
  - 4. Anchor veneer anchor back plate to steel stud with two (2) polymer-coated, steel drill screws: ASTM C954 except manufactured with hex washer head and neoprene washer,

No. 10 diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B117.

D. Finish: hot dip galvanized.

#### 2.04 VENEER ANCHORING SYSTEM (THROUGH INSULATION TO CMU OR CONCRETE WALLS)

- A. Description: Single screw veneer tie anchoring system for masonry veneer to concrete masonry or concrete construction with plastic wing nut.
- B. Provide: 3/16" diam. compressed leg 2X-Hook veneer anchor, ASTM A82/A82M (70 ksi. yield strength), hot dip galvanized.
  - 1. Embed pintles (hooks) in the mortar joint and extend into the veneer a minimum of 1-1/2", with at least 1" cover to the outside face.
- C. Install directly to CMU and concrete walls.
  - 1. At CMU walls space mechanical ties at 12" o.c. vertically (with 12" tall veneer) and 16" o.c. horizontally.
  - 2. At concrete walls, space mechanical ties at 12" o.c. vertically (with 12" tall veneer) and 20" o.c. horizontally.
  - 3. Install at 12" o.c. ea. way within 8" around perimeter of openings in veneer that exceed 16" in any direction.
  - 4. Pre-drill CMU and concrete to accept screw.
- D. Finish: type 304 stainless steel with polymer coated screw.
- E. Product: 2-Seal Thermal Concrete Wing Nut Anchor with 2X-Hook by Hohmann & Barnard, Inc. ([www.h-b.com](http://www.h-b.com)) or Architect approved equivalent.

#### 2.05 MASONRY ANCHORING SYSTEM (MASONRY ANCHORED TO STRUCTURAL STEEL)

- A. Description: vertically adjustable mechanical anchoring system for masonry to steel construction. All columns that face and are adjacent (within 2 inches) to masonry shall have masonry anchors on those sides for full height of masonry. All steel beams that face masonry shall have masonry anchors on the web of the beam facing the masonry for the full length of the beam.
- B. For vertical applications (faces of columns): Provide #317 (1/4-inch diameter) continuous wire rod anchor welded to steel members. Use #316's when CMU is parallel with steel. Use #318 triangular ties when CMU is perpendicular to steel. All as manufactured by Heckmann Building Products, Inc. or approved equivalent. Where face of columns are covered by insulation, use Hohmann & Barnard HB-213-2x (12 ga. backplate) adjustable veneer anchors welded or mechanically fastened to steel columns.
- C. For horizontal applications (webs of beams): Provide #315 (1/4-inch diameter) wire rod anchors welded to steel members. The veneer ties are to be a triangular wire, 3/16-inch diameter. Use #316's when CMU is parallel with steel. Use #318 triangular ties when CMU is perpendicular to steel. All as manufactured by Heckmann Building Products, Inc. or approved equivalent.
- D. Install as indicated on the drawings. When not indicated space triangular ties at 16 inches on center for vertical applications and space anchors and triangular ties at 16 inches on center for horizontal applications.
- E. Finish: #315's and #317's furnish plain or galvanized, painted with steel in shop. #316's and #318's hot dip galvanized 1.5 oz. per sq. ft. ASTM A153, Class B-2.

## 2.06 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

## 2.07 MOVEMENT JOINT PRODUCTS

- A. Hohmann & Barnard or approved equivalent
1. Control joint - RS Series Rubber Control Joint
    - a. Preformed Control Joint Gaskets: Rubber - ASTM D2000
    - b. Designed to fit standard sash block and to maintain lateral stability
    - c. Install in as continuous piece vertically as possible.
  2. Joint Stabilization Anchors
    - a. Slip-Set Stabilizer
    - b. Finish: hot dip galvanized.
    - c. Install at masonry vertical control joints at 2'-0" o.c. vertically.
  3. Veneer Control Joint at existing structure interface:
    - a. 3/8" x 3" NS Closed Cell Neoprene Sponge
    - b. Slip-Set Stabilizers at 2'-0" o.c. vertically - field bend one end ninety degrees and attach to existing structure.

## 2.08 GROUT SCREEN

- A. Hohmann & Barnard or approved equivalent
1. MGS Mortar/Grout Screen based on CMU thickness.
  2. Use where required to maintain grout in filled cells.

## 2.09 THROUGH-WALL FLASHING (BASE FLASHING, THRU-WALL FLASHING)

- A. Flexible Flashing: For flashing not exposed to the exterior, use the following self adhesive (clear), non-asphalt composite membrane with a minimum thickness of 40 mils, unless otherwise indicated:
1. Textroflash™ Flashing by Hohmann & Barnard, Inc.
  2. Flex-Flash® Flashing by Hohmann & Barnard, Inc.
  3. Architect approved equivalent guaranteed not to "drool" when exposed to UV or heat.
- B. Flashing Primer: Use water-based self-adhering flashing primer as recommended by flashing manufacturer.
- C. Stainless Steel Drip Edge (Drip Plate):
1. 26-gauge Type 304 stainless steel drip plate, 2-1/2" wide with a 3/16" hemmed drip.
  2. Provide factory formed inside and outside corners.
- D. Termination Bar (top):
1. 26 gauge x 1-1/2", 304 stainless steel with 3/8" flange on top to receive field applied sealant.

## 2.10 WALL DRAINAGE AND VENTILATION

- A. Description: Cell ventilation and weep units.
1. Provide "Quadro Vent™" as manufactured by Hohmann & Barnard, Inc. or approved equivalent.
  2. Install directly on top of through wall flashings and at highest point in cavity at 24" o.c. in brick veneer conditions and 32" o.c. in cast stone and ACMU veneer.
  3. Color: to be selected by Architect.

4. If cell vent appears in profiled unit (Bullnose, chamfered, etc.) trim cell vent to profile shape.

#### 2.11 IN WALL CAVITY MORTAR NETTING

- A. Description: 90% open polymeric mesh with insect barrier to allow unobstructed passage of air and water as base of wall cavity.
- B. Product: Mortar Net® with Insect Barrier, by Mortar Net Solutions™, 10" high by thickness required.
- C. Match product size to cavity size. Cavity should be no more than ¼" wider than 1" thick material and 2" thick material, and 0.4" thick material should touch both the outer wythe and the inner wall. For cavities larger than 2", place rigid insulation of sufficient height to extend at least 6" above the top of the Mortar Net® with Insect Barrier against the outside of the inner wythe and of appropriate thickness to reduce the cavity to the appropriate size or add additional layers of Mortar Net® to fill width of cavity.

#### 2.12 COMPRESSIBLE FILLER

- A. Premolded filler strips complying with ASTM D1056, Grade 2A 1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Products:
  1. NS Closed Cell Neoprene Sponge as manufactured by Hohmann & Barnard, Inc.
  2. #3300 Expansion Joint as manufactured by Wire-Bond.

#### 2.13 EXPANSION BOLTS (ATTACHING STEEL MEMBERS TO MASONRY WALLS)

- A. Description: Stud type with a single piece three section wedge and zinc plated in accordance with ASTM B633 or where specified, type 304 or type 316 stainless steel. See Contract Drawings for locations where stainless steel is required. Anchors shall be installed in drilled holes per manufacturer's recommendations.
- B. Product: Hilti Kwik Bolts, diameter as specified, by Hilti Corp. or Architect approved equivalent.

#### 2.14 ADHESIVE ANCHOR BOLTS (ATTACHING STEEL MEMBERS TO MASONRY ELEMENTS)

- A. Description: Threaded anchor rods, nut and washer, a cylindrical mesh screen tube and an injectable adhesive (components A and B) material. Screen tube and anchors shall be installed in drilled holes and per manufacturer's recommendations. Anchor rods supplied in accordance with ASTM A 36, or if required: ASTM F 593 (AISI 304 stainless steel). Nuts shall be furnished to meet the requirements of the above anchor rod specifications. Anchors rods (non-stainless steel), nuts and washers to be zinc plated in accordance with ASTM A 153.
- B. Product: Hilti HIT-HY 10 PLUS, diameter as specified, by Hilti Corp. or Architect approved equivalent.

#### 2.15 RIGID TIES (ATTACHING INTERSECTING MASONRY WALLS TOGETHER WHEN TOOTHING IS UNATTAINABLE)

- A. Description: Mild steel "Z" ties, 1/4" thick, 1 1/2" wide x 24" long, with 2" long bent legs, hot dip galvanized. Install at 16" o.c. vertically into fully grouted cores. Adjust overall length when field conditions do not permit use of 24" length. Use longest possible length that permits bent legs to fall in grouted cores.

- B. Product: Rigid Partition Anchor Type #344 by Hohmann & Barnard, Inc. or Bent Anchor Type 140 by Heckmann Building Products, Inc. or Architect approved equivalent.

#### 2.16 PARTITION TOP ANCHOR

- A. Description: Mild steel, 12 gauge, 8" long with 2" long bent legs, hot dip galvanized. Install at 24" o.c. horizontally. Provide NS-Neoprene sponge in gap between top of CMU and bottom of anchor.
- B. Product: PTA Type #422 by Hohmann & Barnard, Inc. or Architect approved equivalent.

#### 2.17 THERMAL BRICK SUPPORT SYSTEM

- A. Thermal Brick Support System with components fabricated from hot-dip galvanized steel as manufactured by Hohmann & Barnard or Architect approved equal. Type: TBS-B (Bracket Style) and TBS-F (Fin Style) as indicated on the drawings.
- B. Fasteners:
  - 1. Provide fasteners of type, grade, and class required to produce connections suitable for anchoring brick support system to other types of construction indicated and capable of withstanding design loads.
  - 2. Fastener Materials: Fabricate fasteners and anchors from stainless steel, 1 or 2, Type 304 stainless steel; temper as required to support loads imposed without exceeding allowable design stresses.
- C. Finishes: Galvanizing: Hot-dip galvanize items as indicated to comply with 1 for steel hardware and with 2 for other steel products.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. If more than one value or requirement is specified, see Contract Drawings for location.

#### 3.02 HORIZONTAL JOINT REINFORCEMENT

- A. Place horizontal joint reinforcing as follows:
  - 1. In solid wall panels, for interior and exterior walls, place at a vertical spacing of 16 in. on center vertically.
  - 2. In exterior parapets, place at a vertical spacing of 8 in. on center vertically.
- B. Place horizontal joint reinforcement in:
  - 1. All concrete unit masonry walls.
- C. Place horizontal joint reinforcing in the two (2) bed joints above and below window, louver, door wall openings, and training openings extending a minimum of 24" beyond the opening (except at vertical control joints). At other special conditions, place horizontal joint reinforcement as described in manufacturer's published instructions and as illustrated on Contract Drawings.
- D. Lap side rods at each end joint a minimum of 6 in. for normal shrinkage stresses.
- E. Install prefabricated corner and tee assemblies at each wall corner and intersection.
- F. Miter and butt end joints are prohibited.



- G. Place horizontal joint reinforcement in approximate center of out-to-out wall assembly and assuring a 5/8 in., minimum, mortar coverage on exterior face.
- H. Install horizontal joint reinforcement continuous, terminating only at vertical control joints.
- I. Cut, form and seal all inside and outside corners.

### 3.03 THROUGH-WALL FLASHING INSTALLATION

- A. Install flashing, drip edge, and termination bar in accordance with manufacturer's printed instructions at all exterior conditions.
  - 1. Use primer as recommended by flashing manufacturer.
  - 2. Install flashing in sections of 8' or less into primed surfaces.
  - 3. Use a roller to firmly press flashing onto surface without air pockets.
  - 4. Seal all non water shedding edges as recommended by flashing manufacturer.
  - 5. Do not leave flashing exposed to UV light for more than 60 days.
- B. Mortar shall be bedded above and below the flashing.
- C. Flash all shelf angles including but not limited to lintels, bond beams, sills, wall bases and any other obstructions to natural flow of water within the wall cavity.
- D. Install end dams a minimum of 2" high U.N.O. at all shelf angles, sills and other ends.
- E. Lap all flashing joints a minimum of 3" and seal with manufacturers approved mastic. Lap all drip edge a minimum of 3" with sealant beads as recommended by manufacturer.
- F. Any penetration of the flashing must be sealed.
- G. All thru wall flashings to rise a minimum of 12" to the interiors. Use termination bar and sealant at exterior sheathing and CMU.
- H. Fasten termination bar to stud wall construction at 16" o.c. maximum and at 8" o.c. maximum for CMU back-up wall construction.

### 3.04 REINFORCED VERTICAL CELLS (VERTICAL REINFORCEMENT)

- A. Place vertical reinforcement in concrete masonry cells as indicated on Drawings using wire-tying or prefabricated bar positioners. Wet-setting reinforcement is not permitted. Comply with requirements in ACI 530.1/ASCE 6/TMS 402/602.
- B. Fill concrete masonry cells with fine or coarse gravel concrete grout (not mortar) as described in Section 042200 "CONCRETE UNIT MASONRY". Grout is specified in Section 036000 "GROUTING".
- C. Place, tie, secure and lap reinforcement pursuant to Section 042200. Vertical bars must be placed within 1/2 inches of the location required within the thickness (out of plane) of the wall. For 12" CMU walls or pilaster, this tolerance can be increased to 3/4 inch.
- D. Reinforcement Bars shall be lapped at splices as follows:

| Bar Size | Min. Lap Distance |
|----------|-------------------|
| #4       | 24 inches         |
| #5       | 30 inches         |
| #6       | 36 inches         |

#7

42 inches

**3.05 BENDING, CUTTING AND SPLICING REINFORCEMENT**

- A. Make bends and splices in reinforcement only where indicated, or prior-approved by Architect. Bend reinforcement only when cold, and prior to any placement in construction, forming around a steel pin of diameter at least 6 times the reinforcement size. Cut bars only by approved sawing, shearing or welding methods. Make ends of reinforcement straight, square, clean and free of defects before splicing. Do not heat or weld bends and splices at points of maximum stress. Clip and bend any tie wires as required to direct the ends away from external surfaces of masonry walls.
- B. Where welding is necessary, provide materials and perform welding in accordance with AWS requirements.

**3.06 MORTAR NET**

- A. Install as per manufacturer's instructions.
- B. Install continuous length of mortar net immediately above all through-wall flashings in masonry veneer applications.

**3.07 EXPANSION/CONTROL JOINTS IN MASONRY VENEER**

- A. Install Joint Stabilization Anchors at 2'-0" o.c. vertically in veneer expansion/control joints. Field bend joint stabilization anchors where CJ/EJs occur at perpendicular veneer. Provide NSTA - Closed Cell Neoprene Sponge in veneer control joints.

**END OF SECTION 040523**

## PART 1 GENERAL

## 1.01 RELATED SECTIONS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Brick Masonry
- B. Related Sections: The following Sections contain requirements that relate to the Section.
  - 1. Section 036000 – Grouting
  - 2. Section 040513 – Mortar
  - 3. Section 040523 – Masonry Accessories
  - 4. Section 042200 – Concrete Unit Masonry
  - 5. Section 047200 – Cast Stone
  - 6. Section 055000 – Metal Fabrications
  - 7. Section 079200 – Sealants

## 1.03 STANDARDS

- A. ASTM C62 "Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)".
- B. ASTM C67 "Standard Test Methods of Sampling and Testing Brick and Structural Clay Tile".
- C. ASTM C216 "Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)".
- D. BIA Technical Notes on Brick and Tile Construction.

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 – Submittal Procedures
- B. Product Data:
  - 1. Submit product data including test results on each type of brick required.
  - 2. Submit product data for proposed cleaning product including instruction for proper application and use.
- C. Samples for Verification & Approval
  - 1. 5 -brick strap for each type or color of brick specified showing extremes of variation in color and texture.
- D. Sustainable Building Requirements
  - 1. Product Certificates for products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
  - 2. Provide certification by the National Brick Research Center (NBRC) per the "Brick as an Environmentally Preferred Product Program".

## 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Technical Notes on Brick and Tile Construction, by Brick Institute of America (BIA), except as more stringently required in the Contract Documents.

## 1.06 SAMPLE PANEL

- A. Before commencing masonry work, erect a sample panel at job site for each separate exposed concrete masonry wall and brick wall. Locate panels where directed by Architect.
- B. Sample panel size for each wall or partition: not less than 6 ft wide by 4 ft high. Construct each sample panel representative of color and texture of the brick, bond, reinforcement, jointing, mortar and workmanship. Modify panel as required by Architect.
- C. Do not start brick work until each sample panel has been approved by Architect. Leave approved sample panel in place during erection of masonry work. Protect approved sample panel against weather and damage. Remove sample panel from site when so directed by Architect.

## 1.07 STORAGE AND PROTECTION

- A. Store brick off ground, under cover, to prevent wetting and contamination by weather, mud, dust and materials likely to cause staining.

## 1.08 PROJECT/SITE CONDITIONS

- A. At end of day, or during a shutdown, protect top surface of all masonry to prevent rain from entering the masonry. Install protection, adequately anchored, to prevent water intrusion to cover top surface and extend a minimum of 2 ft down all sides of masonry.
- B. Brace walls according to NCMA and ANSI.
- C. Prevent and remove immediately any mortar, grout and soil droppings that come in contact with masonry.
- D. Protect base of walls from rain-splashed mud and mortar by means of coverings on ground and over wall surface.
- E. Cold Weather Requirements: Comply with National Concrete Masonry Association (NCMA) TEK Spec #3-1C "All Weather Concrete Masonry Construction."

## PART 2 PRODUCTS

## 2.01 FACING BRICK

- A. Qualities:
  - 1. Dimensions: Standard Modular 3-5/8" x 2-1/4" x 7-5/8"
  - 2. Texture: One finished face and one finished end; provide two finished ends and finished faces where visible in the Work.
  - 3. Visible flat side: Provide uncored, unfrogged units with one flat side matching finished face for use at locations where flat side is visible in the Work.
  - 4. Shapes: Provide shapes as indicated on Drawings, with finished faces at all locations where they will be visible in the Work. Do not cut brick to make shapes.

5. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site
6. Basis of design: Bowerston Shale Company: #1003 Sunfire Smooth
7. Architect to select color from Manufacturer's full range

B. Referenced Standards: ASTM C216, Grade SW, Type FBS.

## 2.02 BRICK CLEANER

- A. Non-Acidic cleaner specific for cleaning brick and removing efflorescence as recommended by brick manufacturer for brick being supplied.
- B. Masonry cleaner if used, must be tested on masonry sample panel.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Examine other construction, which supports or connects with masonry work. Where such construction as footings and shelves are not sound or level, where anchorage devices have not been installed, where interferences exist, or where there are other conditions unsuitable for proper installation or performance of the masonry, do not start masonry work until defective earlier construction has been completed or corrected.

### 3.02 CONDITIONING BRICK

- A. Wet brick with absorption rate greater than 20 grams/min/30 sq. in., as determined by ASTM C67, so that rate of absorption when laid does not exceed this amount.
- B. Do not dip individual brick in water before laying. Instead, play a hose on piled brick until water runs from brick. Wet down 1 day before brick are to be used. In hot weather, wet down 2 to 4 hours before brick are to be used.

### 3.03 COURSING AND BOND

- A. Course brick as shown on Drawings.
- B. Layup brick with approximately 3/8 in. bed joints, uniformly adjusted to produce the specified coursing. Make head joints the same width as bed joints.
- C. Layup brick in stretcher, header, rowlock, bull header (stretcher rowlock), soldier, or sailor position with only good faces and good ends showing. Cut brick to make headers in veneer and show good end only.
- D. Shapes: Provide shapes as indicated on Drawings, with finished faces at all locations where they will be visible in the Work. Do not cut brick to make shapes.
- E. Finish visible brick joints using non-rusting tools to form hard impervious surface by hard tooling to a concave profile "U" joint.
- F. Compress joints and cut flush in unexposed work except at joints below grade. Hard tool joints below grade to a concave profile.

## 3.04 INSTALLATION

- A. Lay brick plumb and true to lines, with level courses. Line up head joints vertically. Use no more than one cut closure in any length of wall. Line up closures vertically.
- B. Layup brick with completely filled mortar joints. Do not furrow bed joints. Butter end of brick with sufficient mortar to fill head joint, then shove in place. Rock closures in place with head joints thrown against two adjoining brick in place.
- C. Tap each unit to line and level as it is placed. Do not disturb any unit once in place except to completely remove and set in a fresh bed of mortar.
- D. Do not pound corners and jambs to fit stretcher units after they have been set in position. Where an adjustment must be made after mortar has started to harden, remove mortar and replace with fresh mortar.
- E. Make all cuts with power masonry saw. Do not use Sawcut faces in exposed work.
- F. Lay up only brick, which have no chipped, cracked or discolored exposed faces. Layup with good face showing, lip (if any) always down, frog (if any) always up. Where flat side is shown, provide a brick with flat un-torn side matching other brick faces, without frog, or core holes.
- G. Tool joints when thumbprint hard, compressing mortar tightly against both sides of joint. Make head joints match profile of bed joints.

## 3.05 ANCHORING

- A. Anchor exterior brick walls facing or abutting concrete members with dovetail or wire anchors inserted in slots built into concrete. Maximum anchor spacing: 16 in. vertically, 24 in. horizontally.
- B. Maintain at least 1/2 in. space between masonry and structural concrete beam or wall faces. Keep space free of mortar and other rigid material to permit differential movement. Anchor brick with dovetail or wire anchors 16 in. on center, inserted into dovetail slots in concrete.
- C. Maintain at least 1/2 in. space between masonry and steel or concrete columns. Place 1/2 in. semi-rigid fiberglass board over steel before laying masonry. Do not mortar space between masonry and steel or concrete columns.
- D. Where bearing walls or non-bearing partitions abut a concrete or steel column, anchor wall to column with dovetail or wire anchors 16 in. on centers, inserted into dovetail slots in concrete or welded to steel.
- E. In brick veneer work over cold-formed steel framing, install anchors as specified in Section 040523 – Masonry Accessories.

## 3.06 WALL INTERSECTIONS

- A. At intersecting bearing or shear walls, which are carried up separately, regularly block vertical joints 3 courses at a time, with 8 in. maximum offsets. Provide joints with rigid steel anchors. Space anchors 48 in. maximum vertically.
- B. At non-bearing partitions, which abut or intersect other walls or partitions, anchor with cavity wall ties at 24 in. maximum vertical intervals. Alternative method: carry wall reinforcement through intersection, and lap at least 8 in.

### 3.07 HORIZONTAL REINFORCEMENT

- A. Place masonry wall reinforcement in bed joints 16 in. on center vertically, with an additional piece above and below openings, extending at least 24 in. beyond each side of opening.
- B. Embed side rods full length of wall, with 5/8 in. minimum mortar cover on exterior side, 1/2 in. cover elsewhere.
- C. Lap reinforcement 6 in. at ends. Do not carry reinforcement through expansion joints and control joints.
- D. Carry reinforcement around corners by cutting one side rod and bending other rod to form a corner angle.
- E. Where masonry walls or partitions intersect, bond together by lapping wall reinforcement. Exception: Do not bond at expansion or control joints.
- F. Tie plumbing walls together with wall reinforcement 16 in. on center, or hooked steel bars providing equal cross-sectional steel area, placed so as not to interfere with plumbing.
- G. At cavity walls place drip pointing downward within cavity.

### 3.08 FLEXIBLE IN WALL FLASHING

- A. Place wall flashing over a thin bed of mortar, always sloping flashing slightly to exterior. Place mortar over flashing to bed brick course above it.
- B. Turn wall flashing at least 8 in. up behind brick and anchor top edge as per detail shown in drawings.
- C. Tape, or seal with asphalt cement, all penetrations in wall flashing. Extend wall flashing around outside of structural columns. Extend wall flashing at least 4 in. beyond lintels and sills and turn up ends to form a pan, which directs moisture to exterior. Lap wall flashing joints at least 4 in. Extend wall flashing to within 1/4 in. of exterior of mortar joint.

### 3.09 WEEP HOLES

- A. See Section 040523 – Masonry Accessories for Wall Drainage and Ventilation.

### 3.10 OTHER WORK

- A. Build in lintels, door frames, windows, flashing, insulation, reglets, inserts, anchors, blocking, sleeves, boxes, cabinets, piping, conduit, and other items whether provided as part of masonry work, as preparation for other work, or furnished by other trades.
- B. Fill steel door frames in masonry walls with grout.
- C. Provide passage for electrical and mechanical lines. Allow and aid placement in walls where lines would be exposed. Cut neat holes for in wall switches and cabinets. Make provisions for passage of lines, and other chases and openings, during laying up of masonry so that later cutting is not necessary. Fill holes after lines and boxes are in place.
- D. Maintain sealant clearances at door, window, and other openings.

- E. Provide lintels at all openings in masonry work, as needed to form openings for windows, louvers, frames, in--wall equipment, through wall ducts and piping, and as otherwise needed to support heads of all openings over 8 in. wide.

### 3.11 CONTROL OF MOVEMENT

- A. For expansion joints, leave full width of joint free of masonry, mortar and reinforcement, ready for backup material and sealant.
- B. For control joints, insert control joint material and leave joint free of masonry and reinforcement.
- C. If control joints are not shown, place them vertically not more than 24 ft on center, within 2 ft of building corners, and at lines of weakness such as at steel columns, changes in building height, and at each side of openings over 8 ft high.
- D. Do not butter masonry units to steel members, except where masonry bears on steel. Maintain 1/2 in. clearance. Fill vertical clearances with 1/2 in. semi-rigid fiberglass or other sort, incombustible board material.
- E. Build non-bearing partitions to a distance 3/8 to 3/4 in. from structural soffit above. When structure above has deflected from building loads placed upon it, wedge partition to structural soffit with metal or slate wedges and fill top joint with mortar.
- F. Straighten and position anchors and protruding reinforcement, which were placed in, reinforced brick lintel concrete to bond fine grout to concrete beam.

### 3.12 PROTECTION

- A. Wall covering:
  - 1. Cover tops of partially completed walls with strong, non--staining, waterproof membrane, securely held in place, extending at least 24 in. down both sides of wall at start of rain, and at end of each day's work on wall.
  - 2. Clamp protective membrane in place using spring wire clamps.
- B. Load application:
  - 1. Do not apply dead, live floor, or roof loading for at least 24 (twenty-four) hours after building masonry columns or walls.
  - 2. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.
- C. Staining:
  - 1. Prevent mortar, grout, and cleaning agents from adhering to, staining or deteriorating masonry and other surfaces to be left exposed or painted.
  - 2. Remove mortar, grout, and cleaning agents from masonry and other surfaces daily. Remove them from sensitive surfaces such as aluminum and glass immediately.
  - 3. Protect sills, ledges, and projections from mortar droppings by means of taped paper guards or a layer of sand.
  - 4. Protect door and window frames during masonry construction. Maintain in plumb, square, true position.

### 3.13 REPAIR OF DEFECTIVE WORK

- A. Remove stained and damaged brick and replace with new units in fresh mortar bed, of color and tooling matching surrounding work. Repair voids and other defects in mortar joints.



## 3.14 CLEANING BRICK

- A. Start cleaning late in the work, after mortar is thoroughly cured.
- B. Dry clean walls before wetting. Remove large particles of mortar with wood paddles and scrapers. Use chisel or wire brush only when wood implements do not work.
- C. Soak wall with copious amounts of clean water from hose, flushing off loose mortar and dirt in the process.
- D. Scrub walls with detergent cleaning agent, using stiff fiber brush.
- E. Rinse off all detergent, dirt, and mortar crumbs using clean water from hose.
- F. Do not use any acid or acid compounds in cleaning brick masonry.
- G. No air blast or sand blast cleaning of masonry shall be allowed.

**END OF SECTION 042113**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes Concrete Masonry Units (CMU) and Architectural Concrete Masonry Units (ACMU) as shown on the Contract Drawings and specified herein.
- B. This Section also includes masonry bond beam lintels.
- C. Mortar, grout and masonry accessories are specified elsewhere.
- D. Related Sections: Sections that contain requirements that relate to this Section include, but are not limited to, the following:
  - 1. Section 036000 - Grouting
  - 2. Section 040513 - Mortar
  - 3. Section 040523 - Masonry Accessories
  - 4. Section 042113 - Brick Masonry
  - 5. Section 047200 - Cast Stone
  - 6. Section 047113 - Calcium Silicate Manufactured Stone

## 1.03 STANDARDS

- A. ACI-530/ASCE5/TMS402 "Building Code Requirements for Concrete Masonry Structures and Commentary".
- B. ACI 530.1/ASCE 6/TMS 602 "Specification for Masonry Structures".
- C. ASTM A615 "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement".
- D. ASTM C55 "Standard Specification for Concrete Building Brick".
- E. ASTM C90 "Standard Specification for Loadbearing Concrete Masonry Units".
- F. ASTM C140 "Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units".
- G. ASTM C426 "Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units".
- H. ASTM C1634 "Standard Specification for Concrete Facing Brick and Other Concrete Masonry Facing Units".
- I. ASTM E119 "Standard Test Methods for Fire Tests of Building Construction and Materials".
- J. ASTM E514 "Standard Test Method for Water Penetration and Leakage Through Masonry".
- K. National Concrete Masonry Association (NCMA) "TEK Notes".
- L. Portland Cement Association (PCA) "Recommended Practices for Laying Concrete Block".
- M. UL 263 "UL Standard for Safety Fire Tests of Building Construction and Materials".

- N. UL 618 "UL Standard for Safety Concrete Masonry Units".

#### 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data:
  - 1. Material Certificates for each type and size of masonry units:
    - a. Include material test reports substantiating compliance with requirements.
    - b. For masonry units include data and calculations establishing average net-area compressive strength of units.
  - 2. CMU/ACMU cleaning agents if any.
  - 3. Field Applied masonry sealer.
  - 4. Reinforcing Steel: Submit steel producers' certificates of mill analysis, tensile and bend tests for reinforcement steel required for masonry reinforcing.
- D. Certification of Compliance: Furnish test reports attesting to compliance with UL-263 or certificates attesting to compliance with UL-618, each or both of which acknowledge compliance with fire ratings specified and strength requirements specified.
- E. Shop Drawings: Submit shop drawings for fabrication, bending and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from a single source, a single production run, and from a single manufacturer for each product required. All ACMU products shall be produced by the same manufacturer.
- B. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 402/602 unless modified by requirements in the Contract Documents.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage
- C. Deliver and handle materials in such a manner as to prevent damage. Store concrete unit masonry and packaged material above ground on wood pallets or blocking and protect from weather until used. Do not double stack. Immediately remove from job site all damaged or otherwise unsuitable material. If units become wet, do not install until they are dry.
- D. Receive, store, and protect construction materials in ways that prevent water from entering materials.
- E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- F. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- G. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.07 SPECIAL INSPECTIONS

- A. The Owner will engage the services of a Special Inspector for this project. The Special Inspector will provide inspection and testing requirements as necessary in accordance with the provisions of the Building Code.
- B. In accordance with the Statement of Special Inspections, the Special Inspector shall provide, and coordinate inspections and verifications as noted on Contract Drawings.
- C. The Special Inspector shall submit copies of reports to Architect, Engineer, Owner's Site Representative and Contractor on day that tests are made. Include date of testing, weather conditions, building location and test location.

#### 1.08 SAMPLE PANEL

- A. Before commencing concrete unit masonry work, erect a sample panel at job site for each separate exposed concrete masonry wall or partition. Locate panels where directed by Architect.
- B. Sample panel size for each wall or partition: not less than 6 ft wide by 4 ft high or size shown on Contract Drawings. Construct each sample panel representative of color and texture of the concrete unit masonry and veneer masonry, cavity insulation, bond, reinforcement, jointing, mortar, flashing, weeps and workmanship. Build in conjunction with brick and cast stone sample panel. Modify panel as required by Architect.
- C. Do not start **any** concrete unit masonry work until sample panel has been approved by Architect **in writing**. Leave approved sample panel in place during erection of masonry work. Protect approved sample panel against weather and damage. Remove sample panel from site when so directed by Architect.
- D. Sample panel should be used for testing of cleaning methods.

#### 1.09 PROJECT/SITE CONDITIONS

- A. At end of day, or during a shut-down, protect top surface of all masonry to prevent rain from entering the masonry. Install protection, adequately anchored, to prevent water intrusion to cover top surface and extend a minimum of 2 ft down all sides of masonry.
- B. Brace walls according to NCMA and ANSI requirements.
- C. Prevent and remove immediately any mortar, grout and soil droppings that come in contact with CMU.
- D. Protect base of walls from rain-splashed mud and mortar by means of coverings on ground and over wall surface.
- E. Protect sills, ledges, and projections from mortar droppings.

- F. Turn scaffold boards near the wall on edge at the end of the day to prevent rain from splashing mortar and dirt onto completed masonry.
- G. Cold Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- H. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 402/602.
- I. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

## PART 2 PRODUCTS

### 2.01 CONCRETE MASONRY UNITS, GENERAL

- A. Regional Materials: CMUs and ACMUs shall be manufactured within 500 miles of Project site from aggregates, cement, and cement replacement products (i.e. flyash, etc.) that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the Project site.

### 2.02 INTERIOR CONCRETE MASONRY UNITS

- A. Hollow load bearing, normal weight, Type I, conforming to ASTM C90, Type 1. Specified concrete masonry strength,  $f'm = 2,000$  psi. (masonry unit net area compressive strength = 2,800 psi.).
- B. Hollow non-load bearing, normal weight, Type I, conforming to ASTM C129, fire resistance rating: 2 hour conforming to UL 618, as indicated on Drawings.
- C. Unit Thickness: as indicated on drawings using longest standard units compatible with coursing. See Drawings for unit heights.
- D. When more than one combination of criteria is specified, see Drawings for locations.

### 2.03 REINFORCEMENT

- A. Uncoated, deformed steel reinforcing bars: Complying with ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
  - 1. Shop-fabricate reinforcement bars which are shown to be bent or hooked.
- B. Horizontal masonry joint reinforcing is specified in Section 040523 - Masonry Accessories.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Examine all surfaces to receive parts of the Work specified herein. Verify all dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the adjacent and underlying construction.

1. Verify that foundations are within tolerances specified.
  2. Verify that reinforcing dowels in foundation walls are properly placed.
- B. In cavity wall construction, verify all masonry veneer anchors extending thru cavity wall insulation are clean of all spray foam insulation and/or other foreign substances. Any required cleaning of masonry eyelets, plates, etc. must be completed **before** the start of veneer construction. Verify cleaning method has not damaged or bent veneer anchors.

### 3.02 GENERAL WORKMANSHIP

- A. Provide all masonry construction aligned, plumb and true in required layout, making straight level courses, unless otherwise specifically indicated. Construct masonry to full thickness as shown with masonry units of sizes as noted and specified, using whole units wherever possible. Cut masonry neatly by power saw to obtain sharp edges without damage, as approved for providing required bond pattern and proper fit at all adjoining construction. Build-in items and leave accurate openings necessary to accommodate installation of other work, in a manner to maintain required strength and appearance of masonry construction. Fill solidly and neatly around conduits and pipes passing through masonry, using mortar unless escutcheons will be used.
- B. No CMU smaller than 4" shall be installed in any wall or work area.
1. The mason shall contact the Architect for interpretation if it appears that smaller than 4" CMU is required.
  2. If the mason installs CMU smaller than 4", he, she or they shall bear the responsibility to remove and replace all effected work.
- C. All exposed CMU at corners to be return corner block.
- D. Exposed outside corners of interior CMU to be bullnose.

### 3.03 CONSTRUCTION TOLERANCES

- A. Construct unit masonry within following tolerances:
1. Maximum variation from plumb in vertical lines and surfaces of columns, walls, and arises and in alignment of head joints:
    - a. 1/4 in. in 10 ft.
    - b. 3/8 in. in a story height not to exceed 20 ft.
    - c. 1/2 in. in 40 ft or more.
  2. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:
    - a. 1/4 in. in any story or 20 ft maximum.
    - b. 1/2 in. in 40 ft or more.
  3. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves, joints, and other conspicuous lines:
    - a. 1/4 inches in any bay or 20 feet.
    - b. 1/2 in. in 40 ft or more.
  4. Maximum variation from plan location of related portions of columns, walls and partitions:
    - a. 1/2 in. in any bay or 20 ft.
    - b. 3/4 in. in 40 ft or more.
  5. Maximum variation in cross-sectional dimensions of columns and thicknesses of walls from dimensions shown on Drawings:
    - a. Minus 1/4 in.
    - b. Plus 1/2 in.

## 3.04 COURSING

- A. Lay walls/partitions as shown on Drawings.

## 3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow units with full mortar coverage on horizontal and vertical face shells. Bed webs in all courses of piers, columns, and pilasters, and in starting course on footings and solid foundation walls, and where adjacent to cells or cavities to be reinforced or filled with grout or concrete. Lay solid units with full head and bed joints.
- B. Mortar joints: 3/8 thick except where otherwise indicated.
  - 1. Exposed joint profile: concave.
  - 2. Concealed joint profile: flush
    - a. All CMU to receive ceramic tile shall have all joints in that face finished flush and smooth.
  - 3. Locations of different joint widths and profiles are shown on the Contract Drawings.
- C. Bond intersecting non-load bearing walls together in same manner as load bearing walls, except that non-load bearing partitions 8 in. or less in thickness may be anchored to each other and to other walls with Architect approved types of accessories specified in Section 040523 Masonry Accessories.
- D. Provide preformed resilient filler strips specified, minimum 3/8-inch thick, between tops of walls and undersides of slabs, or decks, or against abutting construction. Set filler strips in joints as masonry is laid up with lengths of strips butted together and all strips firmly compressed. Use solid masonry units, solidly filled units, or end units at such locations.
- E. At steel and/or structural concrete columns, provide anchors specifically designed and suited to each condition encountered and as specified in Section 040523 - Masonry Accessories as applicable.
- F. At steel columns and elsewhere as indicated, provide preformed resilient filler strips specified. Completely cover all surfaces of columns to be encased in masonry. Neatly fold and fit covering tightly against flange and web surfaces and secure against displacement by taping or tying in place as applicable.
- G. Where masonry units abut steel and/or structural concrete columns where such joints are exposed to view, use corner block units to create a straight line joint/interface between the two materials.
- H. Lintels:
  - 1. Install loose lintels in all required locations (masonry openings wider than 18 inches). Note that not all openings requiring loose lintels are detailed on the Contract Drawings. Provide steel angle lintels itemized in the loose lintel schedule on the Contract Drawings. Lintels at exterior openings and where otherwise indicated shall be galvanized.
  - 2. Provide minimum 8 inches bearing at each jamb, U.N.O. and bed lintels in mortar.
- I. Refer to Section 040523 - Masonry Accessories for information on thru-wall flashing.
- J. Grout hollow metal frames in masonry walls solidly with grout. Perform grouting without clogging holes, boxes, or spaces, required for the proper installation, or operation of hardware.

- K. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat, uniform appearance.
- L. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
  - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  - 2. Allow cleaned surfaces to dry before setting.
  - 3. Wet joint surfaces thoroughly before applying mortar.

### 3.06 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. Install flashing in accordance with NCMA TEK 19-04A, *Flashing Strategies for Concrete Masonry Walls*; NCMA TEK 19-05A, *Flashing Details for Concrete Masonry Walls*; and details shown on the Contract Drawings.
- B. General: Install embedded flashing and weep holes in masonry at base of wall, shelf angles, lintels, ledges, other obstructions to the downward flow of water in the cavity, and where shown on the Contract Drawings.
- C. Install flashing as follows, unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping mortar bed and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At multiwythe masonry walls, including cavity walls and at masonry veneer walls extend flashing through veneer, across air space behind veneer, and up the face of the sheathing or inner masonry wall a minimum of 8 inches or as shown on the Contract Drawings which ever is greater. Install stainless steel termination bar at top of all flashings unless noted otherwise. Apply sealant to top edge of termination bar.
  - 3. Install stainless steel drip plate at exterior termination of flashing. Seal through-wall flashing to top of drip plate.
  - 4. At lintels, shelf angles, heads, sills, etc. provide end dams at ends of all through-wall flashing.
  - 5. Lap all joints in flashing in accordance with flashing manufacturers recommendations.
  - 6. At inside and outside corners where through wall flashing is required provide preformed flashing corners or neatly cut and fold flashing, adding additional material where required and sealing all joints in accordance with manufacturer's recommendations to form a continuous waterproof membrane.
- D. Provide weep capability in mortar joints at 32" on center horizontally at base of each exterior wall by means of a manufactured insert installed in accord with manufacturer's published instructions.
- E. Provide weep capability in mortar joints at 32" on center (or spacing as shown on the Contract Drawings) horizontally at base of all through wall flashings at sills, lintels, shelf angles and any other location of through wall flashing.
- F. Provide vent capability in mortar joints at 32" on center horizontally at the tops of all cavity walls by means of a manufactured insert installed in accordance with manufacturer's published instructions.



## 3.07 INSTALLATION

- A. Lay out walls in advance for accurate spacing of bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and where possible at other locations. Where required to provide bond pattern, dry cut units with saw and then thoroughly clean to remove cementitious sawings. Install to fit adjoining work neatly, all with clean, sharp, unchipped edges.
- B. Use only dry CMU - do not wet.
- C. Build walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- D. Install door frames, interior hollow metal window frames, lintels and other items furnished by other sections designed to be anchored into CMU construction as CMU is built.
- E. Construct recesses in interior CMU walls to accommodate recessed or semi-recessed cabinets and/or equipment.
- F. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. Fasten partition top anchors to structure above and build into top of partition. Space anchors 48" o.c. unless otherwise indicated. In some instances, structural edge angles may be used on each side of CMU wall at intersection with floor/roof.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078400 - Firestopping.
- G. Lay masonry in a one-half running bond pattern with vertical joint in each course centered on units in courses above and below unless indicated otherwise on Contract Drawings.
- H. All masonry shall be laid on a full bed of mortar coverage or horizontal and vertical face shells and webs. All head and bed joints to be tooled.
- I. Fill cores in hollow CMUs with grout a minimum 24" under bearing plates, beams, lintels, posts, and similar items unless otherwise noted.
- J. When stopping and resuming work, in each course rack back 1/2-unit length. Do not tooth. Clean exposed surfaces of set masonry and remove loose CMU/ACMU and mortar prior to laying new CMU.
- K. Care shall be taken when laying exterior split face ACMU to maintain visual appearance of wall by placing units with similar split face profiles adjacent to each other. Every effort shall be made to avoid excessive protrusions of adjacent split faces at mortar joints. Units with excessive projections or units with excessive indentations shall be discarded.

## 3.08 PLACING REINFORCEMENT

- A. Provide joint reinforcement of types required for locations indicated or specified. Remove all deleterious matter from surfaces before placement, including loose rust and scale adversely affecting bond to mortar or grout. Install reinforcement in accurate position, aligned true and secured against displacement, with a minimum mortar cover of 5/8 in. at exterior face of walls and 1/2 in. at other locations.

- B. Provide deformed steel bars as vertical or horizontal reinforcement in masonry construction where indicated or specified. Place vertical bar reinforcing in as continuous lengths as practicable, inserting after laying of masonry and before grouting. Use approved devices to support vertical reinforcement at top, bottom, and intervals not exceeding 160 bar diameters. Wet-setting reinforcement is not permitted. Install horizontal bars as masonry is laid up. Lap all bar reinforcement by distance equal to 48 diameters.
- C. Vertical bars must be placed within 1/2 inch of the location required within the thickness (out of plane) of the wall. For 12" CMU walls or pilaster, this tolerance can be increased to 1 inch.
- D. Reinforce bond beams with two (2) #5 bars unless otherwise noted.
- E. Provide minimum vertical reinforcing of one #4 bar in window and door jambs, at ends of walls, corners, and each side of vertical control joints. Locate bar a maximum of 16 inches from end of CMU. If typical vertical wall reinforcing noted is larger than #4, use the larger size.

### 3.09 GROUTING OF WALL CONSTRUCTION

- A. Use specified "fine" grout mixture to fill wall spaces up to 1-1/2 in. wide or to fill cells up to 4 in. size in hollow masonry units, and use specified "coarse" grout mixture only to fill spaces or cells having larger dimensions at all locations. Grout walls only after setting mortar has stiffened, and columns or pilasters have been braced or tied, as required to prevent displacement of masonry and reinforcement or ties due to pressure of grout pours. Clean and wet surfaces of preceding pour before placing new grout. Provide grouting in continuous manner, with not less than 30 minutes nor more than 1 hr between lifts of any given pour. If grouting is stopped more than 1 hr, form a horizontal construction joint by stopping pour 2 in. below top of uppermost masonry course. Remove all debris, mortar droppings or other matter from cavities and cells before grouting. Consolidate each grout lift with a rod to provide uniform flow into all spaces or voids.
  - 1. Low-lift Grouting Method: Provide low-lift grouting as the laying of masonry and placement of reinforcement progresses. For grouting of wall spaces, first lift may be placed up to 16 in. high but limit all subsequent pours to maximum 12 in. lifts placed before masonry coursing is 24 in. higher than preceding pour. For grouting of cells in adjacent hollow masonry units, allow setting mortar to cure at least 4 hr after laying masonry, and place grout in cells up to top masonry course at a maximum 48 in. height above preceding pour.

### 3.10 CONTROL JOINTS

- A. Refer to Section 040523 - Masonry Accessories for information on products.
- B. Install control joints at locations shown on the Drawings. If locations of control joints are not shown, provide vertical control joints spaced not to exceed 28 feet; locate joints at points of natural weakness in the masonry Work. This would include doors, windows, overhead doors and changes in heights of walls.
- C. Mortar Control Joints: Fill abutting cells of masonry units with mortar after installing asphalt felt at one side of joint to break the bond. Rake out joints to a depth of 3/8 inch.
- D. Pre-molded Control Joint Strips: Provide sash block units as required. Install joint strip as the Work progresses. Compress strips as masonry units are laid.
- E. Build non-bearing partitions to a distance 3/8 to 3/4 in. from structural soffit above. When structure above has deflected from building loads placed upon it, wedge partition to structural soffit with metal or slate wedges and fill top joint with mortar.

- F. Do not butter masonry units to steel members, except where masonry bears on steel. Maintain ½ inch clearance. Fill vertical clearances with ½ inch semi-rigid fiberglass or other sort, incombustible board material.
- G. Straighten and position anchors and protruding reinforcement which were place in reinforced brick lintel concrete so as to bond fine grout to concrete beam.

### 3.11 REPAIR MASONRY

- A. At completion of the Work, fill with mortar and suitably tool all holes in joints of masonry surfaces to be exposed or painted. Repair any cracks in masonry. Cut out and repoint defective joints.
- B. Repair masonry construction as required due to damaged or defective work and where required to accommodate adjacent materials in an approved manner so that patching is not visually apparent.
- C. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match and install in fresh mortar, pointed to eliminate evidence of replacement.
- D. When pointing, tool all joints required to enlarge any voids or holes, except weep holes, and then completely fill with mortar. Point up all joints including corners, openings and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

### 3.12 CLEANING

- A. Shall commence after mortar is thoroughly set and cured. Remove large mortar particles by hand with wooden or non-metallic tools. Test cleaning methods on sample wall panel, leaving 1/4 panel uncleaned for comparison purposes.
- B. Obtain Architect's approval of sample cleaning before proceeding with cleaning of CMU/ACMU.
- C. Clean CMU using ProSoCo Enviro Klean® 2010 All Surface Cleaner or approved equivalent recommended and approved by the CMU/ACMU supplier.. Handle and apply per manufacturer's written instructions.
- D. No acid or acid based cleaners shall be used. Follow cleaning methods as per National Concrete Masonry Association TEK Spec 08-4A *Cleaning Concrete Masonry*.
- E. Dry brush CMU/ACMU walls at end of each day's work and after final pointing. Leave clean and free from mortar spots and droppings.

### 3.13 FIELD APPLIED SEALER

- A. Apply two coats in accordance with manufacturer's instructions on all exterior CMU and CMU mortar joints. Apply one coat in accordance with manufacturer's instructions on all interior CMU and CMU mortar joints.
- B. Protect adjacent work (cast stone, windows, doors, fascia, etc.) from sealer over spray.

### 3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site and legally dispose of off Owner's property..

- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Crush masonry waste to less than 4 inches in each dimension.
  - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 - EARTH MOVING.
  - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

**END OF SECTION 042200**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Cast stone trim.
    - a. Window sills.
    - b. Surrounds and Crossheads.
    - c. Coping.
    - d. Water tables.
    - e. Date Stone.
    - f. Maltese.

## 1.03 PERFORMANCE REQUIREMENTS

- A. General Performance: Design cast stone anchors and anchoring systems in accordance with ASTM C1364.
- B. Delegated Engineering Responsibility: Employ a delegated engineering professional to provide engineering work for work of this Section to comply with the design intent expressed in the Contract Documents.
  - 1. Cast stone anchoring shall be engineered to withstand structural design loads within the limits and under the conditions required without material failure according to the following:
    - a. Applicable local and state building codes.
    - b. Authorities having jurisdiction.
  - 2. Comprehensively analyze location, type, magnitude and direction of loads imposed.
  - 3. Prepare engineering calculations, shop drawings and other submittals and affix design professional engineer's seal according to respective jurisdictional licensing regulations.
- C. Structural Performance: Provide cladding system capable of withstanding the effects of gravity loads and the following loads and stresses within the limits and under conditions indicated:
  - 1. Wind Loads:
    - a. Uniform Pressure: As indicated on the drawings.
    - b. Basic Wind Speed: 130 mph.
    - c. Importance Factor: 1.15.
    - d. Exposure Category: B.
  - 2. Seismic Loads: Provide anchoring capable of withstanding the effects of seismic loading using the design parameters as indicated on the drawings.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
  - 1. Include building elevations showing layout of units and locations of joints and anchors.
- C. Samples for Initial Selection: For colored mortar.

- D. Samples for Verification:
  - 1. For each color and texture of cast stone required, 10 inches square in size.
  - 2. For each trim shape required, 10 inches in length.
  - 3. For colored mortar, make samples using the same sand and mortar ingredients to be used on the project.
- E. Full Size samples: For each color texture and shape of cast stone unit required:
  - 1. Make available for Architect's review at the Project Site.
  - 2. Make Samples from materials to be used on Project.
  - 3. Approved Samples may be installed in the Work.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
  - 1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C1364.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364, including test for resistance to freezing and thawing.
  - 1. Provide test reports based on testing within previous two years.
- C. Delegated Professional Engineer's Qualifications demonstrating compliance with specifications.

#### 1.06 DELEGATED DESIGN SUBMITTALS

- A. Delegated Design Submittal: For cast stone systems indicated to comply with the performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Include pertinent diagrams and design calculations.

#### 1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.
- B. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.
- C. Installer's Qualifications: Cast Stone work shall be installed by a firm normally in the business of installing work of the type indicated for a minimum of ten years.
- D. Delegated Engineering Professional Qualifications: Professional Engineer legally authorized to practice in the jurisdiction where the Project is located and experienced in providing engineering services of kind indicated that has resulted in work similar to this project and who has a record of successful in-service performance.
- E. Testing Agency Qualifications: Qualified in accordance with ASTM E329 for testing indicated.
- F. Mock-ups: Build mock-ups to verify selections made under Sample submittals and to demonstrate the aesthetic effects and set quality standards for materials and execution.

#### 1.08 PREINSTALLATION MEETINGS

- A. Preliminary Conference: Before starting cast stone removal, conduct conference at Project site.

1. Meet with the Architect, Construction Manager and Manufacturer's Representative
  - a. Review methods and procedures related to demolition and fabrication.
  - b. Review requirements for salvaging material.
- B. Pre-installation Conference: Conduct conference at Project site.
  1. Meet with the Architect, Construction Manager, Installer and Manufacturer's Representative, testing and inspecting agency and other installers whose work interfaces with or affects cast stone installation.
    - a. Review methods and procedures related to installation.
    - b. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
    - c. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast stone units in suitable packs or pallets.
  1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
  2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained without contamination.

#### 1.10 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 402/602/ASCE6/TMS 602.
  1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 402/602/ASCE 6/TMS 602.

### PART 2 - PRODUCTS

#### 2.01 CAST STONE UNITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Arriscraft International
  2. Corinthian Cast Stone, Inc.
  3. David Kucera, Inc. (DKI)
  4. Great Lakes Cast Stone, Inc.
  5. Stone Legends, Dallas, Texas.

- B. Provide cast stone units complying with ASTM C1364 using wet-cast method.
  - 1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C666/C666M, Procedure A, as modified by ASTM C1364.
  - 2. Units: As indicated on the drawings.
  - 3. Color: As selected by Architecture from Manufacturer's selection
  - 4. Texture: Smooth
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
  - 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
  - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
  - 3. Provide drips on projecting elements unless otherwise indicated.
- D. Fabrication Tolerances:
  - 1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
  - 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
  - 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
  - 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.
- E. Cure units as follows:
  - 1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 degrees F for 12 hours or 70 degrees F for 16 hours.
  - 2. Keep units damp and continue curing to comply with one of the following:
    - a. No fewer than five days at mean daily temperature of 70 degrees F or above.
    - b. No fewer than six days at mean daily temperature of 60 degrees F or above.
- F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G. Colors and Textures: As selected by Architect from manufacturer's full range.
- H. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.
- I. Absorption - ASTM C 1195: 6.0% maximum by the cold water method.
- J. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4.0-8.0% for units exposed to freeze-thaw environments. Air entrainment is not required for Vibrant Dry Tamp (VDT) products.
- K. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5.0% after 300 cycles of freezing and thawing.
- L. Linear Drying Shrinkage – ASTM C 426: Test and report in accordance with ASTM C1364.

## 2.02 MORTAR MATERIALS

- A. Comply with requirements in Section 042200 - Concrete Unit Masonry and for mortar mixes.



## 2.03 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.
- B. Dowels: 1/2 inch diameter round bars fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M or ASTM A666.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc

## 2.04 MORTAR MIXES

- A. Comply with requirements in Section 042200 - CONCRETE UNIT MASONRY for mortar mixes.
- B. Do not use admixtures including pigments, air entraining agents, accelerators, retarders, water repellant agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise noted.
- C. Comply with ASTM C270, Proportion Specification.
  - 1. For setting mortar, use Type N.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
  - 1. Mix to match existing.
  - 2. Application: Use colored-aggregate mortar for exposed mortar joints.

## 2.05 JOINT PROTECTIVE SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide joint protective system consisting of a molded cap or fillet with a splined tang for anchoring sealant filled mortar joints as manufactured by Weathercap, Inc. or an approved equal product.
- B. Materials:
  - 1. Tee Caps, Corners/ Fillets:
    - a. Use size of strips as recommended by the manufacturer.
    - b. Strips should be of sufficient size to cover the joint width, plus a percentage allowance for anticipated joint movement, plus 1/4".
  - 2. Sealant: As recommended by protective joint system manufacturer and as specified in Section 079200 - JOINT SEALANTS.
    - a. Prime ends of cast stone units insert properly sized backing rod and install sealant.
    - b. Provide sealant joints at following locations:
    - c. Prime ends of cast stone units insert properly sized backing rod and install sealant.
    - d. Provide sealant joints at following locations:
      - 1) Cast stone units with exposed tops.
      - 2) Joints at relieving angles.

- 3) Control and expansion joints.
- 4) As indicated on the drawings.

## 2.06 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C1364.
  1. Include one test for resistance to freezing and thawing.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
  1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
  2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
  3. Coordinate installation of cast stone units with installation of flashing specified in other sections and as indicated on the drawings.
- B. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- C. Set units in full bed of mortar with full head joints unless otherwise indicated
  1. Set units with joints to match existing unless otherwise indicated.
  2. Build anchors and ties into mortar joints as units are set.
  3. Fill dowel holes and anchor slots with mortar.
  4. Fill collar joints solid as units are set
  5. Build concealed flashing into mortar joints as units are set. Provide pan type flashing at sill conditions.
  6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
  7. Keep joints at shelf angles open to receive sealant. Maintain weep openings.
- D. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint width.
- E. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
- F. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control and pressure-relieving joints; and at locations indicated.
- G. For Sealant filled joints:
  1. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

2. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
  - a. Form open joint of width indicated, but not less than 3/8 inch (10 mm).
3. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
4. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 - JOINT SEALANTS

H. Provide joint protection system where indicated.

### 3.03 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

### 3.04 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
  1. Remove mortar fins and smears before tooling joints.
  2. Remove excess sealant immediately, including spills, smears and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
  1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
  2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning prior to proceeding with cleaning of cast stone.
  3. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water as recommended by the manufacturer.
  4. Clean cast stone with proprietary acidic cleaner applied and removed in accordance with the manufacturer's written instructions.

**END OF SECTION 047200**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Calcium silicate masonry units.

## 1.02 RELATED SECTIONS

- A. Section 04 05 23 - Masonry Accessories.
- B. Section 04 72 00 - Cast Stone Masonry.

## 1.03 SAMPLES

- A. Submit samples as specified in Section 013300 - SUBMITTALS.
- B. Samples: Three 4" x 8" size samples, illustrating color and texture.

## 1.04 TEST REPORTS

- A. Submit test reports as specified in Section 013300 - SUBMITTALS.
- B. Test Reports: test results prepared by an independent testing agency, indicating tested material characteristics as part of a source quality control program, current within the past five (5) years.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: manufacturer having sufficient plant facilities to produce the shapes, quantities and size of Products required in accordance with the project schedule.
- B. Installer: Company or person specializing in commercial masonry work with ten years documented experience.
- C. Mock-up: Supply sufficient quantity of full size calcium silicate masonry units for use in constructing a 48" height x 60" long mock-up panel including all wall characteristics, including but not limited to: full cavity wall construction showing flashing, drip edges, weep locations and size, masonry wall ties, air and weather barriers, reveals, watertables, jointing and mortar color(s), sealants and topical applications specified. Include any other items specifically requested by the Architect.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.
- B. Deliver calcium silicate masonry units in protective film. Prevent damage to units.
- C. Lift skids with proper and sufficiently long slings or forks with protection to prevent damage to units. Protect edges and corners.
- D. Store units in a manner designed to prevent damage and staining of units.
- E. Stack units on timbers or platforms at least 3 inches above grade.
- F. Place polyethylene or other plastic film between wood and other finished surfaces of units when stored for extended periods of time.
- G. Cover stored units with protective enclosure if exposed to weather.

- H. Do not use salt or calcium-chloride to remove ice from masonry surfaces.

#### 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Refer to Section 014536 - ENVIRONMENTAL QUALITY CONTROL.
- B. Conform to requirements of ACI 530.1/ASCE 6/TMS 602, Specifications for Masonry Structures, PART 1.8.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers of calcium silicate masonry units having Products considered acceptable for use:
  - 1. Arriscraft International
  - 2. Or approved equal.
  - 3. Substitution Procedures: refer to Instructions to Bidders and Section 012500 - PRODUCT SUBSTITUTION PROCEDURES.

#### 2.02 MATERIALS

- A. Calcium Silicate Masonry Units: to ASTM C73, Grade SW; solid units that have been pressure formed and autoclaved; 3-5/8" bed depth; special shapes as indicated; and as follows:
  - 1. Modular Size: 3 5/8 inch high, 23 5/8 inch long;
  - 2. Texture: rocked and smooth finish as indicated on drawings on exposed faces and ends;
  - 3. Color: as selected by the Architect from the manufacturers full range of color offering;

#### 2.03 ACCESSORIES

- A. Mortar: 1:1:6 Portland cement-hydrated lime-sand mix
- B. Grout: maximum 6,500 psi at 28 days.
- C. Wall Ties and Anchorages: as specified in Section 040523 – Masonry Accessories .
- D. Joint Sealants and Backer Rods: non-staining type, as specified in Section 079200 - JOINT SEALANTS.
- E. Flashing, Vents, and Masonry Accessories: as specified in Section 040523 – Masonry Accessories

#### 2.04 FABRICATION TOLERANCES

- A. Fabricate calcium silicate masonry units to the following tolerances:
  - 1. Unit Length: plus or minus 1/16".
  - 2. Unit Height: plus or minus 1/16".
  - 3. Deviation From Square: plus or minus 1/16", with measurement taken using the longest edge as the base.
  - 4. Bed Depth: plus or minus 1/8".
  - 5. Custom Unit Dimensions: plus or minus 1/8".

#### 2.05 SOURCE QUALITY CONTROL

- A. Test calcium silicate masonry units as specified in Section 014500 - QUALITY CONTROL

- B. Test compressive strength and absorption from specimens selected at random from plant production.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify site conditions are ready to receive work.
- B. Inspect materials for fit and finish prior to installation. Do not set unacceptable units.
- C. Beginning of installation means acceptance of existing conditions.

### 3.02 CUTTING MASONRY UNITS

- A. Cut masonry units with wet-saw.
- B. Pre-soak units using clean water prior to cutting.
- C. Clean cut units using a stiff fibre brush and clean water. Allow units to surface dry prior to placement.
- D. Finish cut edges to match face when exposed in wall.

### 3.03 WETTING MASONRY UNITS

- A. Where the ambient air temperature exceeds 100°F or exceeds 90°F with a wind velocity greater than 8 mph, pre-wet masonry units.
- B. Lay wetted units when surface dry.

### 3.04 COURSING

- A. Place masonry to lines and levels indicated.
- B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- C. Lay masonry units in half-running bond.
- D. Course one masonry unit and one mortar joint to equal 4 and 12 inches.
- E. Maintain mortar joint thickness of 3/8 inch.
- F. Tool joints when thumbprint hard, to a concave finish.

### 3.05 PLACING AND BONDING

- A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, deep or excessive furrowing of mortar joints are not permitted.
- B. Fully bond intersections, and external corners.
- C. Do not adjust masonry units after laying. Where resetting of masonry is required, remove, clean units and reset in new mortar.

- D. Install loose galvanized steel lintels as scheduled.
- E. Install wall ties and anchorages as specified in Section 042113 - BRICK MASONRY.
- F. Install flashings, vents, and masonry accessories as specified.
- G. Construct movement joints as specified in Section 042113 - BRICK MASONRY.

### 3.06 SITE TOLERANCES

- A. Erect masonry within the tolerances described in TMS 602/ACI 530.1-/ASCE 6, Specifications for Masonry Structures, PART 3.3G.

### 3.07 FIELD QUALITY CONTROL

- A. Perform inspection and testing as specified in Section 014500 - QUALITY CONTROL.
- B. Architect Review of Work: Architect] will review installed masonry and reject masonry that is chipped, cracked, or blemished, streaked, stained or otherwise damaged, as described below.
  - 1. Masonry will be reviewed to be free of cracks or other blemishes on the finished face or front edges of the masonry units exceeding 3/8 inch or that can be seen from a distance of 10 feet.
  - 2. Units shall exhibit a texture approximately equal to the approved sample when viewed under diffused daylight illumination at a 10 foot distance.
  - 3. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under diffused daylight illumination from a 10 foot distance.
  - 4. Make Good rejected masonry as directed by Architect/Engineer.

### 3.08 ADJUSTING AND CLEANING

- A. Repair chips on smooth finished units with patch kits furnished by manufacturer.
- B. SPEC NOTE: Select one of the following Paragraphs. Edit as recommended by calcium silicate masonry unit manufacturer's recommendations. Refer to Arriscraft•CARE, Notes to Assist in the Cleaning and Application of Arriscraft Masonry Units.
- C. Clean one-half of mock-up panel as directed below and leave for one week. If no harmful effects appear, all objectionable stains have been removed and after mortar has set and cured, clean masonry as follows:
  - 1. Protect windows, sills, doors, trim and other work from damage.
  - 2. Remove large particles with stiff fiber brushes or wood paddles without damaging surface.
  - 3. Saturate masonry with clean water and flush off loose mortar and dirt.
  - 4. Dilute cleaning agent with clean water in controlled proportions.
  - 5. Apply solution to pre-soaked wall surface using soft-bristled brush or low pressure acid-resistant sprayer.
  - 6. Thoroughly rinse cleaning solution and residue from wall surface.
  - 7. Use alternative cleaning solutions and methods for difficult to clean masonry only after consultation with masonry unit manufacturer.

### 3.09 PROTECTION

- A. Protect units from damage resulting from subsequent construction operations.
- B. Use protection materials and methods which will not stain or damage units.

- C. Remove protection materials upon Substantial Completion, or when risk of damage is no longer present.

**END OF SECTION 047313**



## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Structural steel.
  - 2. Grout.
  - 3. Base Plates.
- B. Related Requirements:
  - 1. Division 01 - "Quality Requirements" for independent testing agency procedures and administrative requirements.
  - 2. Section 053100 - "Metal Decking" for field installation of shear connectors through deck.
  - 3. Section 055000 - "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame not defined as structural steel.
  - 4. Section 055100 "Metal Stairs".
  - 5. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and for surface-preparation and priming requirements.

## 1.03 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
  - 1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches (38 mm).
  - 2. Welded built-up members with plates thicker than 2 inches (50 mm).
  - 3. Column base plates thicker than 2 inches (50 mm).

## 1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## 1.05 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Shop drawings and required calculations shall bear the seal and signature of a registered Professional Engineer licensed in the state in which the project is located. Structural steel shop drawings will not be reviewed without said seal and signature.
    - a. A full set of engineered calculations for all beam to column moment connections shall be submitted to the engineer of record for approval. The steel fabricator drawings shall not be reviewed without said engineering calculations affixed with a seal and signature of a professional engineer licensed in the state in which the project is located.
  - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 3. Include embedment Drawings.
  - 4. Indicate profiles, sizes, spacing and locations of structural members, openings, attachments, fasteners, connections, cambers, holes and other pertinent data. Include locations of structural members, openings, attachments and loads.
  - 5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  - 6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
  - 7. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer / fabricator.
- B. Welding certificates: Submit certificates certifying that welders employed in the work have met AWS qualifications within in the previous 12 months.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties. Indicate structural strength, destructive and non-destructive test analysis.
- E. Product Test Reports: For the following:
  - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 2. Direct-tension indicators.
  - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
  - 4. Shear stud connectors.
  - 5. Shop primers.
  - 6. Non-shrink grout.

#### 1.08 QUALITY ASSURANCE

- A. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.
- B. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.

- C. Delegated Connection Designer: Connections not fully detailed on the contract drawings shall be designed under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the work is located. The shop drawings shall bear the seal and signature of same professional engineer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
  - 2. Welders who are welding structural members fabricated in the shop or in the field, in the five boroughs must have a NYCDOB issued welder licence.
- E. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC Code of Standard Practice for Steel Buildings and Bridges - AISC 303.
  - 2. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - AISC 360.
  - 3. RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products to/at the site under the supervision of Division 01 of this Project Manual.
- B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and experience. who bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

#### 1.10 COORDINATION

- A. Coordinate the work under Division 01 specification of this Project Manual.
- B. Coordinate the selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another.
- C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.
- D. Coordinate the work of this section with utility installations and all other adjacent work.

- E. Coordinate the work of this section such that general progress of the Work is not interrupted.

#### 1.11 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the plans and approved shop drawings.
- B. The contractor is responsible for the proper location and elevations of the work.

### PART 2 - PRODUCTS

#### 2.01 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated where beam end reactions are not shown on drawings. Connection designer shall design shear connections to resist the reaction resulting from the maximum allowable uniform load of the beam found in the AISC Specification being applied along its full length.
  - 1. Select and complete connections using AISC 360.
  - 2. Use Load and Resistance Factor Design; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained. Provide design and details of moment connections to resist forces shown on the contract drawings.
- C. Construction: Moment frame and Braced frame.

#### 2.02 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels, Angles, M-Shapes: ASTM A 36/A 36M.
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C, seamless structural tubing.
- F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
  - 1. Weight Class: as indicated on the contract documents.
  - 2. Finish: Black except where indicated to be galvanized.
- G. Welding Electrodes: Comply with AWS requirements.

#### 2.03 BOLTS, CONNECTORS, AND ANCHORS

- A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
  - 1. Finish: Hot-dip zinc coating.

2. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers with plain finish.
  1. Direct-Tension Indicators: ASTM F959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
  1. Finish: Plain.
- E. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- F. Anchor Bolts: ASTM A307, Grade C for non-moment resisting anchor rods. ASTM F1554, 36 and 55 ksi yield strength for moment resisting anchor rods.
  1. Nuts: ASTM A563 heavy-hex carbon steel.
  2. Plate Washers: ASTM A36/A36M carbon steel.
  3. Washers: ASTM F436/F436M, Type 1, hardened carbon steel.
  4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Threaded Rods: ASTM A 36/A 36M.
  1. Nuts: ASTM A563 ASTM A563M heavy-hex carbon steel.
  2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
  3. Finish: Plain.
- H. Clevises: Made from cold-finished carbon steel bars, ASTM A108, Grade 1035.
- I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1030.
- J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1018.

#### 2.04 PRIMER

- A. Primer: Comply with Division 09
- B. Primer: SSPC-Paint 15, Type I, red oxide.
- C. Ensure primer is compatible with required topcoat.
- D. Galvanizing Repair Paint: ASTM A 780/A 780M.

#### 2.05 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

- B. Grout shall consist of a premixed compound with cement, water reducing and plasticizing additives capable of developing a minimum compressive strength of 7000 psi at 28 days.

## 2.06 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 5. All wide flange structural steel members shall be fabricated in accordance with ASTM A992/A992M. All miscellaneous steel members including channels, angles, S, HP, and M shapes shall be fabricated in accordance with ASTM A36/A36M.
  - 6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
  - 7. All shop connections shall be welded or high strength bolted.
  - 8. Bearing surfaces shall be planed true to provide full bearing over the entire surface.
  - 9. Continuously seal joined members by intermittent welds and plastic filler. Grind welds smooth where exposed or where interference with other building materials is encountered.
  - 10. Splicing is not permitted unless indicated on the Contract Documents or accepted on the final approved Shop Drawings.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Mechanically thermal cut bolt holes shall not be permitted unless prior approval by the Architect is obtained in writing.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning," unless a more stringent cleaning method is required for selected primers and / or other coatings.
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Shop prime non-exposed steel members after fabrication in accordance with SSPC- PA. Do not prime surfaces that will be fireproofed, field welded or are in contact with concrete or high strength bolts.
- H. Paint exposed structural steel members in accordance with the applicable Division 09 Specification section.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning unless approved by the Architect in writing.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.07 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
  1. Joint Type: Snug tightened unless otherwise shown on the contract documents or required by the connection designer.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.08 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
  2. Surfaces to be field welded.
  3. Surfaces of high-strength bolted, slip-critical connections.
  4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  1. SSPC-SP 2, "Hand Tool Cleaning."
  2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

## 2.09 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
  1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
  2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

## 2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
  1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
  - 1. Inspection and Tests will not relieve the contractor of responsibility for providing materials, fabrication and erection procedures in compliance with the specified requirements. The contractor shall verify that all materials meet or exceed the requirements specified in these specifications, Contract drawings and related references. Materials not in compliance with the specified requirements will be rejected and required to be removed from the site.
- C. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M , Grade A325 or Grade A490 Bolts."
- D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M type required for materials being welded and the following inspection procedures, at testing agency's option:
  - 1. Liquid Penetrant Inspection: ASTM E165/E165M.
  - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - 3. Ultrasonic Inspection: ASTM E164.
  - 4. Radiographic Inspection: ASTM E94.
- E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other drawings for compliance with requirements.
  - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other drawings showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

### 3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
  - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
  - 2. Clean bearing surfaces and other surfaces which will be in permanent contact with the work.



## 3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Proceed with the installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.
- C. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.
- E. Erect all components in accordance with the approved shop drawings.
- F. Field weld components and shear studs as indicated on approved shop drawings and in accordance with AWS D1.1/D1.1M.
- G. Do not field cut or alter structural members without written approval of the Engineer.
- H. Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
  - 5. Coordinate placement of anchors in concrete or masonry construction for securing base plates.
- I. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- J. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- K. Splice members only where indicated.
- L. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

- N. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- O. Erect all components in accordance with approved shop drawings. After erection, prime welds, abrasions and surfaces not shop primed or galvanized as required, except surfaces to be in contact with concrete.
- P. Field weld components and shear studs as indicated on the approved shop drawings and in accordance with AWS D1.1/D1.1M.

### 3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened Pretensioned unless specifically identified as pretensioned or slip-critical on the contract documents or calculations by the Delegated Connection designer.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
  - 4. Connections and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used in shop finishing.

### 3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Verify structural-steel materials and inspect steel frame joint details.
  - 2. Verify weld materials and inspect welds.
  - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test high strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
  - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E165/E165M.
    - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - c. Ultrasonic Inspection: ASTM E164.
    - d. Radiographic Inspection: ASTM E94.

- E. Post Installed Mechanical Anchors, Adhesive Anchors and Screw Anchors: Comply with 2020 New York State Building Code Table 1705.3.
  - 1. The special inspection shall include the verification of compliance with approved construction documents and standards established by the Commissioner pursuant to Section 28-113.2.2 of the Administrative Code.
- F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

### 3.06 TOLERANCES

- A. All members shall be installed within AISC tolerances and as follows:
  - 1. Maximum variation from plumb: 1/4" (6mm) per story, non-cumulative.
  - 2. Maximum offset from true alignment: 1/4" (6mm).

### 3.07 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Touchup Priming: Cleaning and touchup priming as specified in Division 9 "High-Performance Coatings" or compatible primer established at the fabricators shop to be compatible with the final finish.

### 3.08 ADJUSTING

- A. All misfits due to errors in location, fabrication, inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Engineer and corrected in a manner subject to the approval of the Engineer.
- B. Submit method of correction to the Architect under Division 01 Specification provisions.
- C. Proceed with corrective work only after receiving written approval from the Architect.
- D. All corrections shall be made at no additional cost to the Owner.

## END OF SECTION 051200



## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Open web steel joists with bridging.
  - 2. Joist Girders with bridging.
  - 3. Loose bearing plates and anchors for site placement.
  - 4. Framed openings greater than 18 inches.
  - 5. Joist accessories.

## 1.03 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support non-uniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."
- C. Fabricator: Company specializing in performing the work of this section with a minimum of five (5) of documented experience.
- D. Erector: Company specializing in performing the work of this section with a minimum of three (3) of documented experience.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, structural steel paint, high strength bolts including nuts and washers.
- B. Shop Drawings:
  - 1. Include layout, designation, number, type, location, and spacing of joists.
  - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
  - 3. Indicate locations and details of bearing plates to be embedded in other construction.
  - 4. Indicate welded connections with AWS D2.0 welding symbols. Indicate weld lengths.
  - 5. Design of connections not detailed on the drawings shall be accomplished under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the project is located.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and professional engineer.
- B. Welding certificates.
  - 1. Submit certificates certifying that welders employed on the project have met AWS Qualification within the last 12 months.
- C. Manufacturer certificates: Certify that products meet or exceed specified requirements..

- D. Mill Certificates: For each type of bolt.
- E. Qualification Data: For Manufacturer. Company specializing in performing the work of this section with minimum of 5 years documented experience.
- F. Erector: Company specializing in performing the work of this section with minimum of three (3) documented experience.
- G. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the project is located.
- H. Field quality -test and inspection reports.
- I. Research / Evaluation Reports: For Joists.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
  - 1. Maintain one copy of document on site.
  - 2. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications and under the provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.
- B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.
- C. Do not store or handle joists in a manner which will damage or distort the joists or supporting structures.
- D. Do not store joists directly on the ground.
- E. Store materials in a manner which will permit easy access for inspection and identification.
- F. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

#### 1.08 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

#### 1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the drawings and approved shop drawings and as required by the manufacturer.
- B. The contractor is responsible for the proper locations and elevations of all work involved in this section.

## 1.10 COORDINATION

- A. Coordinate the work under provisions of Division 01 specification of the contract documents.
- B. Coordinate the work of this section with utilities and mechanical work installation and all other adjacent work.
- C. Coordinate the placement of anchor bolts with the installation of masonry work.
- D. Coordinate the work of this section such that the progress of the construction work is not interrupted.

## PART 2 - PRODUCTS

## 2.01 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
  - 1. Use ASD; data are given at service-load level.
  - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
    - a. Floor Joists: Vertical deflection of 1/360 of the span.

## 2.02 K, LH-SERIES, AND JOIST GIRDERS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series", "Standard Specifications for Longspan Steel Joists, LH-series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
  - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists. Size as indicated on the drawings.
  - 2. Joist Type: LH series steel joists. Size as indicated on the drawings.
  - 3. Joist Girders: Size as indicated on the drawings.
  - 4. Acceptable manufacturers:
    - a. Vulcraft Nucor Group.
    - b. Canam.
    - c. Architect/Engineer approved equivalent.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members
- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds and methods used in correcting the welding work.
- D. Welding Materials: AWS D1.1/D1.1M; type required for the materials being welded.
- E. Provide holes in chord members for connecting and securing other construction to joists.
- F. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications" - ASTM A36/A36M.
- G. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications" - ASTM A36/A36M.
- H. Camber joists according to SJI Standard Specifications.

- I. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).
- J. Weld threaded lugs to chords for attachment of wood nailers
- K. Frame special sized openings in joist chord framing member configurations as detailed.
- L. Design and fabricate top and/or bottom chord bridging for net uplift on steel roof joists as per design loads provided on the contract drawings and in accordance with the New York State Building Code and SJI Standard Specifications.
- M. Bolts, Nuts and Washers: ASTM A325; galvanized to ASTM A153/A153M for galvanized members; thread excluded from the shear plane; beveled washers for connection to members with flange slope greater than 1:20.

### 2.03 PRIMERS

- A. Primer: SSPC-Paint 15, Type 1, red oxide or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

### 2.04 FINISHES

- A. Prepare joist surfaces in accordance with SSPC-SP 2 or SSPC-SP 3.
- B. Shop prime joists after fabrication in accordance with SSPC-PA 1. Do not prime surfaces that will be fireproofed, field welded or in contact with concrete.
- C. Field welds, connections, and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used for shop finishing.

### 2.05 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates from ASTM A36/A36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.
  - 1. Finish: Plain; uncoated.
- D. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts galvanized to ASTM A153/A153M; threads excluded from the shear plane; beveled washers for connection to members with flange slope greater than 1:20; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.
  - 1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.
- E. Welding Electrodes: Comply with AWS standards.
- F. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20, ASTM A780/A780M.
- G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.



## 2.06 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories. Shop prime joists after fabrication in accordance with SSPC-PA 1. Do not prime surfaces scheduled to be fireproofed, field welded or to be in contact with concrete.
- C. Field weld, connections and abrasions shall be cleaned, repaired and finished in the same manner and with the same materials used for shop finishing.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Verify existing conditions under the provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications joist manufacturer's written recommendations, and requirements in this Section."
  - 1. Before installation, splice joists delivered to Project site in more than one piece.
  - 2. Clean joist bearing surfaces of any debris or foreign matter.
  - 3. Verify bearing surface is smooth and flat.
  - 4. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.
  - 5. Field weld components and shear studs as indicated on approved shop drawings in accordance with AWS D1.1/D1.1M.
  - 6. Space, adjust, and align joists accurately in location before permanently fastening.
  - 7. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction and remain plumb and in true alignment until completion of erection and installation of permanent bridging and bracing.
  - 8. Delay rigidly connecting bottom- chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Frame openings greater than 18 inches with supplementary framing.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM

A325 or ASTM A490 Bolts" for high-strength structural bolt installation and tightening requirements.

- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- G. Do not permit erection of decking until joists are braced, bridged and secured.
- H. Do not field cut or alter structural members without the approval of the joist fabricator and the Engineer.
- I. After erection; prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.

### 3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds, bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Testing and analysis of components shall be performed under the provisions of Section 014500 - QUALITY CONTROL.
- C. Inspection and tests will not relieve the Contractor of responsibility for providing materials and fabrication and erection procedures in compliance with specified requirements. The Contractor is to verify that all materials meet the requirements specified in these specifications.
- D. Materials not in compliance with the specified requirements will be rejected.
- E. Visually inspect field welds according to AWS D1.1/D1.1M.
  - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
    - a. Liquid Penetrant Inspection: ASTM E165/E165M.
    - b. Magnetic Particle Inspection: ASTM E709.
    - c. Ultrasonic Testing: ASTM E164.
    - d. Radiographic Testing: ASTM E94.
- F. Visually inspect bolted connections.
- G. High-strength, field bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."
- H. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- I. Perform additional testing to determine compliance of corrected Work with specified requirements.
- J. Additional testing will be performed to determine compliance of corrected Work with the specified requirements.

### 3.04 TOLERANCES

- A. All joists shall be installed within SJI tolerances and the following:
  - 1. Maximum variation from plumb: 1/4 inch.

2. Maximum offset from true alignment: 1/4 inch.

### 3.05 ADJUSTING

- A. All misfits due to errors in location or fabrication or inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Architect and corrected in such a manner subject to the approval by the Architect.
- B. Submit method of correction to the Architect for approval under the provisions of Section 014500 - QUALITY CONTROL.
- C. Proceed with corrective work only after receiving written approval from the Architect.
- D. All corrections shall be made at no additional cost to the Owner.

### 3.06 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime welds, rust spots, and abraded surfaces of joists, bearing plates, and accessories which are not shop primed, except surfaces to be in contact with concrete.
  1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
  2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Protect finished work under the provisions of Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that joists and accessories are without damage or deterioration at time of final acceptance by the Owner.

**END OF SECTION 052100**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Roof deck and accessories.
  - 2. Composite floor deck.
  - 3. Non-composite form deck and accessories.
  - 4. Formed steel cant strips.
  - 5. Pourstop angles, cell closures and end forms to contain wet concrete.
  - 6. Bearing plates and angles
  - 7. Framing for openings up to and including 18 inches.
  - 8. Closure panels for cell voids.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated provide deck profile characteristics and dimension, structural properties and finish.
  - 1. Include a statement indicating costs for each product having recycled content.
- B. Shop Drawings:
  - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction. Indicate temporary shoring of decking where required. Indicate welded connections using standard AWS A2.0 welding symbols and indicate net weld lengths.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Submit under the provisions of Section 013300 - SUBMITTALS.
- B. Welding certificates.
- C. Product Certificates: For each type of steel deck by product manufacturer.
- D. Manufacturer's instructions: indicate special installation sequence and special instructions required for proper installation.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
  - 1. Power-actuated mechanical fasteners.
- F. Research/Evaluation Reports: For steel deck.

## 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Installer: Company specializing in performing the work of this section with a minimum of three (3) years of documented experience.

- C. Design deck layout, spans, fastening and joints under the supervision of a Professional Structural Engineer experienced in the design of this work and licensed in the State in which the project is located.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.
- G. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- H. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

#### 1.06 PERFORMANCE REQUIREMENTS

- A. Metal decking design shall be in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Substitutions shall be designed to meet or exceed published section properties of the specified materials. Section properties shall be computed in accordance with American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members.
- B. Lateral deflection of diaphragm shall not exceed  $1/500$  of the story height. Maximum vertical deflection shall not exceed  $1/240$  of the span length.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Cut plastic wrap to encourage ventilation.
- C. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- D. Do not handle products in a manner which will distort or damage materials.
- E. Do not store decking directly on the ground.
- F. Store materials in a manner which will permit ease of access for inspection and identification.
- G. Schedule delivery of the materials to the site at intervals which will ensure uninterrupted progress of the work.
  - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

## 1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the contract drawings and approved shop drawings as required by the manufacturer.
- B. The contractor is responsible for the proper locations and elevations of the work of this section.

## 1.09 COORDINATION

- A. Coordinate the work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
- B. Coordinate the work of this section with utility installations and all other adjacent work.
- C. Coordinate the work such that the general progress of the work is not interrupted.

## 1.10 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Metal decking design shall be in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Substitutions shall be designed to meet or exceed published section properties of the specified materials. Section properties shall be computed in accordance with the American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members
- C. Lateral deflection of diaphragm shall not exceed 1/500th of the story height. Maximum vertical deflection shall not exceed L/240th of the span length.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

## PART 2 - PRODUCTS

## 2.01 METAL ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Nucor Corp.; Vulcraft Division.
  - 2. Canam.
  - 3. New Millennium Building Systems.
  - 4. Substitutions shall be permitted only after receiving approval from the Architect/Engineer.
- B. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
  - 1. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Minimum 33 Ksi yield strength, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Manufacturer's standard.
  - 2. Deck Profile: Type B or as indicated on the drawings.

3. Profile Depth: 1-1/2 inches (38 mm) or as indicated on the drawings.
4. Design Uncoated-Steel Thickness: 20 gauge unless otherwise indicated.
5. Span Condition: Simple span.
6. Side Laps: Overlapped.

## 2.02 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Nucor Corp.; Vulcraft Group.
  2. Canam.
  3. New Millennium Building Systems.
  4. Architect/Engineer approved equivalent.
- B. Composite Form Deck: Fabricate ribbed-steel sheet composite form-deck panels to comply with "SDI Specifications and Commentary for Composite Steel Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 80 (550) minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Manufacturer's standard.
  2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 80 (550), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Gray.
  3. Profile Depth: As indicated on the contract drawings.
  4. Design Uncoated-Steel Thickness: As indicated on the contract drawings.
  5. Span Condition: Simple span.
  6. Side Laps: Overlapped.

## 2.03 NON-COMPOSITE FORM DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Nucor Corp.; Vulcraft Group.
  2. Canam.
  3. New Millennium Building Systems.
  4. Architect/Engineer approved equivalent.
- B. Non-composite Form Deck: Fabricate ribbed-steel sheet no composite form-deck panels to comply with "SDI Specifications and Commentary for Non-composite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 80 (550) minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Manufacturer's standard.
  2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 80 (550), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Gray.
  3. Profile Depth: 1-5/16 inch. or as indicated on the contract drawings..
  4. Design Uncoated-Steel Thickness: 24 gauge, 0.0239 inch (0.61 mm).
  5. Span Condition: Simple span.
  6. Side Laps: Overlapped.

## 2.04 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Welded Materials: AWS D1.1/D1.1M.
- C. Primer: Flexible, Rust inhibitive.
- D. Touch-up Primer: Red Oxide Type.
- E. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- F. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- G. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber. one inch thick profile to fit tight to decking in compression.
- H. Shear Connectors: 3/4 inch diameter. 4 1/2" inch long welded headed studs. locate as indicated on the contract drawings.
- I. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material, gauge and finish as deck; of profile indicated or required for application.
- J. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- K. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- L. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- M. Recessed Sump Pans: Single-piece steel sheet, 14 gauge or 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch (76-mm) wide flanges and sloped recessed side pans of 1-1/2inch (38-mm) minimum depth below deck surface. For drains, cut holes in the field.
- N. Galvanizing Repair Paint: ASTM A780/A780M.
- O. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- P. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
- Q. Closure Panels: Neoprene Blend-FR as manufactured by Carrington Specialty Products, Inc., or approved equal.
  - 1. Fire-rated Neoprene-blend formed to match profile of deck at each location.
  - 2. Install compatible backer rod and sealant to seal all edge conditions airtight.
  - 3. Physical Characteristics:
    - a. Nominal Density: 5 to 7 pcf.
    - b. Tensile Strength: 50 psi.
    - c. Elongation: 150% to break.
    - d. Compression Set: 50% of original thickness.



- e. Compression Strength: 2 to 5 psi (at 25% deflection).
- f. Working Temperature: -40 to 160 degrees F.
- g. Water Absorption by Weight: 5% maximum.
- h. Flammability: HF-1 as per UL 94.

## 2.05 SOURCE QUALITY CONTROL

- A. Testing and analysis of components will be performed under provisions of Section 014500 - QUALITY CONTROL.
- B. Inspection and tests will not relieve the Contractor of responsibility for providing materials and fabrication and erection procedures in compliance with specified requirements. The Contractor is to verify that all materials meet or exceed the requirements specified in these specifications.
- C. Materials not in compliance with the specified requirements will be rejected

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means that the installer accepts the existing conditions.

### 3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Clean all bearing surfaces of debris and foreign matter.
- E. Verify bearing surface is smooth and flat.
- F. Bear decking on steel supports with 1 1/2 inch (38 mm) minimum bearing.
- G. Provide decking free of amounts of lubricants or oils which would impair the adhesion of spray on fireproofing or painting.
- H. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- I. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- J. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- K. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

- L. Fasten deck to steel support members at ends and intermediate supports with fusion welds at 12 inches on center maximum, parallel with the deck flute and at each transverse flute. Weld washers are to be used only with decks 24 gauge or thinner.
- M. Mechanically fasten male/female side laps at 24 inches on center maximum for decking thinner than 20 gauge. Weld male/female side laps at 18 inches on center maximum for decks 20 gauge and heavier.
- N. Reinforce steel deck openings from 6 to 18 inches (150 to 460 mm) in size with 2 inch x 2 inch x 1/4 inch (50 mm x 50 mm x 6 mm) steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- O. Install 6 inch (150 mm) minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Fusion weld 12 inches (300 mm) on center maximum.
- P. Install sheet steel closures and angle flashings to close openings between deck and walls, columns and openings.
- Q. Install single row of foam flute closures above walls and partitions perpendicular to deck flutes.
- R. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- S. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

### 3.03 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
  - 1. Weld Diameter: 3/4 inch (19 mm), nominal.
  - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of roof and 6 inches (150 mm) apart in roof corners and perimeter based on roof-area definitions in FMG Loss Prevention Data Sheet - FM DS 1-28.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (457 mm), and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
  - 2. Mechanically clinch or button punch.
  - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds where deck is thicker than 20 gauge.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
  - 1. End Joints: Lapped 2 inches (51 mm) minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck flutes. Space welds not more than 6 inches apart with at least one weld at each corner.
  - 1. Install reinforcing channels or zees in ribs to span between supports and weld .

- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- F. Place metal cant strips in position and fusion weld.
- G. Install sheet steel closures and angle flashings to close openings between deck and walls, columns and openings.

### 3.04 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
  - 1. Weld Diameter: 3/4 inch (19 mm), nominal.
  - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
  - 3. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
  - 2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds where deck is thicker than 20 gauge.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
  - 1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated. Where steel angles are not utilized, install stops at floor edge upturned to the top surface of the slab to contain wet concrete. Provide stop of sufficient strength to remain in place and stationary without distortion.
- E. Floor deck closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and deck.
- F. Position floor drain pans with the flanges bearing on the top surface of deck. Fusion weld at each deck flute.
- G. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

### 3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.06 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

**END OF SECTION 053100**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Pitched roof rafters.
  - 2. Stud wall framing.
  - 3. Flat ceiling and attic floor joist framing.
  - 4. Joist framing.
  - 5. Collar ties.
  - 6. Parapet framing and bracing.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
  - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
  - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
  - 3. The design of the cold-formed steel framing shall be the responsibility of the contractor's fabricator. The sizes (depth) of the steel studs shall be as shown on the contract drawings. Unless specifically indicated on the construction documents, it shall be the responsibility of the design engineer to size the spacing and gauge of the element as well as the total depth of the member in the case of header and sill design.
  - 4. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 5. The contractor's fabricator shall provide a full set of engineering calculations as well as a complete set of shop drawings affixed with a New York State Professional Engineer's sign and seal. The design of the cold-formed steel elements shall be in conformance with the information shown on the contract documents and shall be in accordance with the 2020 Building Code of New York State.
- C. Fabrication Drawings:
  - 1. Prior to fabrication submit fabrication and erection drawings for review and approval by the architect/ engineer. Indicate component details, framing for openings, bearing anchorage, temporary bracing, welds or type and location of mechanical fasteners and accessories or items required of other work for complete installations. Included manufacturer's instructions for securing studs to tracks and for other framing connections.
  - 2. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.

- C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
  - 1. Steel sheet.
  - 2. Expansion anchors.
  - 3. Power-actuated anchors.
  - 4. Mechanical fasteners.
  - 5. Vertical deflection clips.
  - 6. Horizontal drift deflection clips
  - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

#### 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct the testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. ClarkDietrich Building Systems, LLC.
  - 2. MarinoWARE
  - 3. Architect/ Engineer approved equivalent.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.

## 2.03 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
  - 1. Grade: ST33H.
  - 2. Coating: G90 or equivalent.
- C. Steel Sheet for Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
  - 1. Grade: 50, Class 1 or 2.
  - 2. Coating: G90.
- D. All studs and/or joists and accessories shall be the type, size, gage, and spacing shown on the plans. Studs, runners (track) bracing, and bridging shall be manufactured per ASTM C955.
- E. All galvanized studs, joists, and accessories shall be formed from steel that conforms to the requirements of ASTM A653/A653M, as set forth in Section 1.02 of the AISI specification for design of cold-formed steel structural members.
- F. All galvanized studs joists and accessories shall have a minimum G60 coating.
- G. Minimum steel gauges shall be 18 gauge for all structural elements subject to gravity and/or lateral wind forces.
- H. Minimum steel gauge for interior elements subject to partition loadings shall be 20 gauge.
- I. All section properties shall be calculated in accordance with the AISI specification for the design of cold-formed steel structural members (latest edition).
- J. Facing materials may not be substituted for bridging. Horizontal bridging must be installed prior to loading the wall and/or floor/roof joists.
- K. The physical and structural properties published by approved supplier will be accepted; otherwise these properties must be substantiated by calculations for loading stresses and deflections of the designed framing sealed by a professional engineer licensed in the State of New York.
- L. Prior to fabrication submit fabrication and erection drawings for review and approval by the architect/ engineer. Indicate component details, framing for openings, bearing anchorage, temporary bracing, welds or type and location of mechanical fasteners and accessories or items required of other work for complete installations. Included manufacturer's instructions for securing studs to tracks and for other framing connections.

## 2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0428 inch, 18 gauge.
  - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, un-punched, with un-stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0428 inch, 18 gauge.
  - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich Building Systems, LLC.
    - b. MarinoWARE
    - c. Steel Network, Inc. (The).
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; un-punched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0538 inch, 16 gauge.
  - 2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

## 2.05 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0428 inch, 18 gauge or as indicated on the construction documents..
  - 2. Flange Width: 2 inches, minimum.

## 2.06 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. Anchor clips.
  - 5. End clips.
  - 6. Stud kickers and knee braces.
  - 7. Hole reinforcing plates.
  - 8. Backer plates.



## 2.07 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.
- G. Column Flange Grip Clips: Pre-manufactured Column/Beam connectors for rapid installation of board type materials to Steel Column and Beam Flanges. ASTM A1003/A1003M Structural Grade 33 (230) Type H, ST33H (ST230H): 33ksi (230MPa) minimum yield strength, 45ksi (310MPa) minimum tensile strength, 27mil minimum thickness (22 gauge, 0.0283" design thickness) with ASTM A653/A653M G60 (Z180) hot dipped galvanized coating. Manufacturer: The Steel Network, Inc. Unit connection box measures 1 inch deep, 2 inches wide and 2 1/2 inches long with a spring clip depth of 2.375 inches and a curved clip spring clearance of .2 inches.
  - 1. Install as indicated on the drawings. Maximum spacing 24 inches on center.

## 2.08 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.09 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
  2. Cut framing members by sawing or shearing; do not torch cut.
  3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
  4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

#### 3.03 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
1. Cut framing members by sawing or shearing; do not torch cut.
  2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work. Welds may be butt, fillet, spot or groove type. The appropriateness of which shall be determined by

and within the design calculations. All welds shall be touched-up using zinc -rich paint to galvanized members and paint similar to that used by the manufacturer for painted members.

- b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 - THERMAL INSULATION in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- J. Wire tying in structural applications is not permitted.

#### 3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: 16 inches unless indicated otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Install single-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to infill studs and anchor to building structure.
  - 4. Connect drift clips to cold formed metal framing and anchor to building structure
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and

thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

- a. Install solid blocking at centers indicated on Shop Drawings.
2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.05 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. All members shall be checked for proper alignment, bearing, completeness of attachments, proper placement and reinforcing.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work where test results indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.06 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

### 3.07 TOLERANCES

- A. Vertical alignment (plumbness) of studs shall be within 1/8 inch in 4 feet of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/8 inch in 4 feet of their respective lengths.
- C. Spacing of studs shall not be more than +1/8 inch from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

**END OF SECTION 054000**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Cold-formed steel trusses for roofs.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include layout, spacing, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
  - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel trusses.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
  - 1. Steel sheet.
  - 2. Expansion anchors.
  - 3. Power-actuated anchors.
  - 4. Mechanical fasteners.
  - 5. Miscellaneous structural clips and accessories.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel trusses from corrosion, deformation, and other damage during delivery, storage, and handling.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Aegis Metal Framing
  - 2. Marino/WARE
  - 3. Nuconsteel, A Nucor Company

## 2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014500 - QUALITY CONTROL to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated.
  - 2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
    - a. Roof Trusses: Vertical deflection of 1/360 of the span.
  - 3. 1-1/4 inches Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
- C. Cold-Formed Steel Framing Design Standards:
  - 1. Floor and Roof Systems: Design according to AISI S210.
  - 2. Lateral Design: Design according to AISI S213.
  - 3. Roof Trusses: Design according to AISI S214.

### 2.03 COLD-FORMED STEEL TRUSS MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:
  - 1. Grade: As required by structural performance.
  - 2. Coating: G90 (Z275) or equivalent.

### 2.04 ROOF TRUSSES

- A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.
  - 1. Connecting Flange Width: 1-5/8 inches (41 mm), minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
  - 2. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
  - 3. Section Properties: As indicated on Certified Delegated Design drawings by N.Y.S. Professional Engineer.

### 2.05 ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

### 2.06 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 55, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

- D. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

## 2.07 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Shims: Load bearing, of high-density multimonomer plastic, non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

## 2.08 FABRICATION

- A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate trusses using jigs or templates.
  - 2. Cut truss members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine supporting substrates and abutting cold-formed steel trusses for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

### 3.03 INSTALLATION

- A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.
- B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Fasten cold-formed steel trusses by welding or mechanical fasteners.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.
- C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- D. Truss Spacing: 24 inches (610 mm).
- E. Do not alter, cut, or remove framing members or connections of trusses.
- F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.
- G. Erect trusses without damaging framing members or connections.
- H. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.04 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Inspection of Field connections as per 1704.3 of the BC of N.Y.S.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Field and shop welds will be subject to testing and inspecting.
- D. Prepare test and inspection reports.



3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

**END OF SECTION 054400**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. This Section includes but is not limited to the following:
  - 1. Loose bearing and leveling plates.
  - 2. Loose steel lintels.
  - 3. Shelf angles.
  - 4. Steel pipe sleeves.
  - 5. Steel framing and supports for mechanical and electrical equipment.
  - 6. Steel framing and hanger rods for accordion, folding and/or moveable partitions.
  - 7. Miscellaneous framing including hoist beam and supports for elevator and elevator equipment.
  - 8. Steel shapes for supporting elevator door sills.
  - 9. Steel framing and supports for applications where framing is not specified in other Sections.
  - 10. Slotted Channel Framing (Unistrut).
  - 11. Steel and galvanized steel pipe bollards.
  - 12. Galvanized overhead door jambs.
  - 13. Interior overhead door jamb extension plates.
  - 14. Miscellaneous plates located above overhead doors.
  - 15. Grate and frame for elevator sump pump pit.
  - 16. Hose reel and overhead door mounting plates to be welded to columns.
  - 17. Frames for antenna mounting.
  - 18. Angles attached to pipe bollards at water service entrance.
  - 19. Surface mounted wall "D" rings.
  - 20. Stainless steel sill protection plates.
  - 21. Rope Tie Offs.
  - 22. Interior manhole frame and cover including support plate.
  - 23. Loose steel angles and steel angles bolted to concrete or masonry.
  - 24. Mezzanine edge angles.
  - 25. Tube steel posts in half height walls and/or parapet walls.
  - 26. Stainless steel hooks for bunting.
  - 27. Guard rails at interior training window openings.
  - 28. Galvanized pipes with weather heads at antenna locations.
  - 29. Galvanized hose hanging brackets with saddle.
  - 30. Training Panel Anchors.
  - 31. Stainless Steel Face Shield Hooks.

## 1.03 RELATED SECTIONS INCLUDE THE FOLLOWING:

- A. Section 031000 - Concrete Forming and Accessories for Apparatus Bay Floor Anchor Pots.
- B. Section 033000 - Cast-In-Place Concrete
- C. Section 036000 - Grouting
- D. Section 040523 - Masonry Accessories
- E. Section 042200 - Concrete Unit Masonry

- F. Section 051200 - Structural Steel Framing
- G. Section 055100 - Metal Stairs, Handrails and Railings

#### 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Fabricator Qualifications: A firm experienced in producing metal fabrications like those indicated for this Project and with a record of successful in-service performance, as well as enough production capacity to produce required units.
- D. Product Data:
  - 1. Shop paint primers.
  - 2. Galvanized Grating.
  - 3. Slotted Channel (Unistrut).
- E. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
  - 1. Provide templates for anchors and bolts specified for installation under other Sections.
  - 2. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
  - 3. Indicate finishes.
- F. Welding Certificates: Copies of AWS certificates for welding procedures and personnel.
- G. Manufacturer's Mill Certificates: Certify that Products meet or exceed specified requirements.

#### 1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code--Steel".
  - 2. AWS D1.3/D1.3M, "Structural Welding Code--Sheet Steel".
  - 3. AWS D1.2/D1.2M, "Structural Welding Code-Aluminum".
  - 4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control programs to ensure compliance with requirements.

#### 1.06 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field

measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

#### 1.07 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates (bearing plates) and angles for casting into concrete and/or bond beams that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

### PART 2 - PRODUCTS

#### 2.01 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, failure of connections, overstressing members and any other detrimental effect. Engineering calculations shall be based on surface temperatures of materials based on local maximum/minimum temperatures due to solar heat gain and nighttime heat loss.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

#### 2.02 FERROUS METALS

- A. Steel, Shapes and Bars: ASTM A 36/A 36M.
- B. W-Shapes: ASTM A 992, Gr. 50.
- C. Steel Plates, Shapes, and Bars: ASTM A36/A 36M.
- D. Plates: ASTM A 283; gage to match existing where not indicated on Drawings.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
  - 1. Galvanized where called for on the Contract Drawings.
- F. Steel Tubing: ASTM A500, cold-formed steel tubing.
- G. Stainless-Steel Sheet, Strip and Plate: ASTM A 240/A 240M or ASTM A 366, Type 304.
- H. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- I. Bolts, Nuts, and Washers: ASTM A 325.
- J. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a

safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

- K. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

### 2.03 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability
1. Recycled Content: Give preference to aluminum with the highest recycled content feasible.
- B. Extruded Structural Pipe: ASTM B 429/B 429M, Alloy 6063-T6.
1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
- C. Extruded Aluminum: ASTM B221, Alloy 6063-T6
- D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

### 2.04 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

### 2.05 FASTENERS

- A. Select and provide fasteners for fastening steel components to base materials, of type and size required to support loads, anchor components to substrates indicated, and develop proper friction, keying, and bonding.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts; ASTM A563; and, where indicated, flat and/or lock washers.
1. Provide countersunk heads where indicated on Contract Drawings.
- C. Stainless Steel fasteners; Type 304 or Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5 at exterior walls unless noted otherwise.
1. Provide countersunk heads where indicated on Contract Drawings.
- D. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M). Use stainless-steel washers with stainless-steel fasteners.

- E. Expansion anchors with countersunk heads as shown on contract drawings.
- F. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated, with nuts, ASTM A 563; and where indicated, flat washers.
  - 1. Hot-dip galvanize where item being fastened is indicated to be galvanized.
- G. Cast-in-Place Anchors in Concrete or Grouted Masonry: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

## 2.06 FABRICATION, GENERAL

- A. Shop Assembly
  - 1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
  - 2. Disassemble units only as necessary for shipping and handling limitations.
  - 3. Use connections that maintain structural value of joined pieces.
  - 4. Clearly mark units for reassembly and coordinated installation.
  - 5. Fabricate steel members in accordance with AISC Code of Standard Practice.
- B. Material
  - 1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
  - 2. Use material free of defects which could affect the appearance or service ability of the finished product.
- C. Size:
  - 1. Size and thickness of members as shown.
  - 2. When size and thickness is not specified or shown for an individual item, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.
- D. Cut, shear, drill and punch metals cleanly and accurately. Remove burrs and ease edges to radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Weld corners and seams continuously to comply with the following:
  - 1. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
  - 2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 3. Obtain fusion without undercut or overlap.
  - 4. Remove welding flux immediately.
  - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- J. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- K. Remove sharp or rough areas on exposed traffic surfaces.
- L. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- M. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- N. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6" embedment and 2" hook, not less than 8" from ends and corners of units and 24" o.c., unless otherwise indicated.
- O. Galvanize and prime items as indicated herein and/or as shown on contract drawings. If not indicated all items shall be prime painted.

#### 2.07 LOOSE STEEL LINTELS

- A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

#### 2.08 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction.
  - 1. Drill plates scheduled to receive anchor bolts.
  - 2. Provide headed embedment studs where indicated.
  - 3. Plates scheduled to be galvanized shall be galvanized after fabrication.

#### 2.09 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

- C. Galvanize miscellaneous framing and supports where indicated. All other miscellaneous framing and supports shall be prime painted.

## 2.10 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 40 galvanized steel pipe. Provide galvanized steel domed caps for field welding.
- B. At exterior bollards in front of overhead bay doors, provide decorative plastic bollard covers
  1. As manufactured by Reliance Foundry Co. Ltd., or approved equal
  2. Model # R-7172
  3. Color: Black

## 2.11 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Aluminum: Clear Anodic Finish; AAMA 611, Class 1, AA-M12C22A41

## 2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
  1. ASTM A 123/A 123M, for galvanizing steel and iron products.
  2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
  1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

## 2.13 BUNTING HOOKS

- A. Provide 3/8" diameter Type 316 stainless steel hooks to support bunting. Provide hooks of sufficient length to penetrate into CMU back-up or solid wood blocking in exterior metal stud back-up a minimum of 2". Epoxy hooks into CMU. Screw hooks into wood blocking. Locate hooks in brick masonry joints at locations as shown on the Contract Drawings.

## 2.14 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 18 inches o.c., unless otherwise shown.
  1. Provide mitered and welded units at inside and outside corners.
  2. Do not cross expansion and/or control joints. Create an open joint in shelf angle at each control/expansion joint 1-1/2 inches larger than expansion/control joint.



3. Coordinate attachment of shelf angles thru continuous insulation.
  4. Shelf angles located in exterior wall assemblies shall be hot dip galvanized.
- B. Furnish wedge-type concrete inserts, complete with corrosion resistant fasteners, to attach shelf angles to cast-in-place concrete

## 2.15 "D" RINGS

- A. Wall mounted "D" ring tie-offs where shown on Contract Documents.
1. 10,000 lb load capacity, super heavy-duty "D" ring tie-off pre-welded to a 6" x 6" x 1/4" steel plate. On masonry surfaces, thru bolt (4) with stainless steel fasteners to two 6" x 1" x 1/4" washer plates. Secure with double nuts. On steel surfaces, weld "D" ring plate to steel plate.
  2. Gempler's item # 173155 or Architect approved equivalent.

## 2.16 SLOTTED CHANNEL FRAMING

- A. Slotted Framing Channels: Cold-formed metal channels with continuous slot complying with MFMA-4.
1. Acceptable Manufacturers:
    - a. Flex-Strut Inc.
    - b. Powerstrut.
    - c. Unistrut.
  2. Material: Steel complying with ASTM A1011 Grade 33; or ASTM A1008/A1008M, commercial steel, Type B structural steel, Grade 33.
  3. Size of channels: As required by structural analysis or as shown on Contract Drawings, but not less than 1-5/8" by 1-5/8", 12 gauge.
  4. Finish: Hot Dip Galvanized unless indicated otherwise.
- B. Slotted Framing Accessories:
1. Provide manufacturer's accessories and fittings as required for a complete installation, including channel nuts, insets, end caps, swivel and swing fittings, supports, joiners, brackets and other accessories as required.
  2. Accessories Finish: Match slotted framing channel finish.

## 2.17 TRANSITION JAMB PLATES AND CORNER GUARDS

- A. Manufacturer: Koffler Sales Company, 785 Oakwood Road, Lake Zurich, IL 60047, Phone: 888-726-1567.
- B. Jamb Plates: 1/8 inch thick aluminum diamond plate, chrome finish, 10" wide x full height of opening. Provide 1/2" diameter, countersunk holes at 12" o.c. (minimum four (4) holes) along both long sides of plate. Centerline of holes 1 1/2" from edge of plate.
- C. Provide 7/16" diameter stainless steel, counter sunk expansion anchors to secure Jamb transition plates and corner guard angles.
- D. Diamond plate aluminum corner guards: 3" x 3" x 17 gauge, chrome finish.

## PART 3 - EXECUTION

### 3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
  - 1. Clean and strip primed steel items to bare metal where field welding is required.
  - 2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 3. Obtain fusion without undercut or overlap.
  - 4. Remove welding flux immediately.
  - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place masonry and/or concrete construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts screws, and other connectors. Provide countersunk heads on fasteners where exposed in finish work.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

### 3.02 SETTING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use nonshrink nonmetallic grout.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
- B. Support steel on solid grouted masonry or concrete. Secure steel with anchor bolts embedded in grouted masonry or concrete.
  - 1. Where grout space under bearing plates is indicated at steel supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.
- C. Overhead Door Jambs and Extension Plates

1. Cover counter sunk stainless steel screw heads with epoxy metal filler. Finish smooth and level with door frame.

### 3.04 INSTALLING SLOTTED CHANNEL FRAMING

- A. Install framing to comply with requirements of items being supported, including manufacturer's written instructions and requirements indicated on Shop Drawings.
- B. Install shop or field fabricated, slotted channel framing and securely anchor to supporting structure, solid wood blocking or masonry construction with grouted cores.
  1. When attaching thru ceiling GWB to roof truss construction, slotted channel must connect to a minimum two roof trusses when truss spacing exceeds four (4) feet and to three (3) roof trusses when truss spacing is less than four feet. Coordinate with roof truss manufacturer for proper style and length of embedment of fastener.
  2. Install slotted channel framing and accessories plumb, square and true to line, and with connections securely fastened.

### 3.05 INSTALLING GALVANIZED PIPE BOLLARDS

- A. Anchor bollards in place as shown on drawings. Support and brace bollards in position in footing excavations until concrete has been placed and cured.
- B. Fill bollards solidly with concrete.
- C. Field weld galvanized dome caps. Grind welds smooth. Fill any gaps with Bondo and finish smooth.
- D. Repair all damaged galvanizing.

### 3.06 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

**END OF SECTION 055000**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes, but is not limited to, the following:
  - 1. Steel framed stairs and landings.
  - 2. Steel guard rails.
  - 3. Steel handrails.
  - 4. Steel gates
  - 5. Mezzanine railings and gates.
  - 6. PE Stamped Shop Drawings
- B. Related Sections: The following Sections contain requirements that relate to this Section.
  - 1. Section 033000 - Cast-In-Place Concrete
  - 2. Section 051200 - Structural Steel Framing
  - 3. Section 061000 - Rough Carpentry for blocking at railing attachment points
  - 4. Section 099100 - Painting

## 1.03 STANDARDS

- A. All work of this section shall conform to CABO/ANSI, industry standards and manufacturer's recommendations.
- B. ASTM A500 "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes".
- C. ASTM A501 "Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing".
- D. American Welding Society (AWS) applicable welding methods and standards.
- E. Corps of Engineers CRD-C 621-83 "Specification for Nonshrink Grout".
- F. FS TT-P-645A "Primer, Paint, Zinc Chromate, Alkyd Type".
- G. National Association of Architectural Metal Manufacturers (NAAMM) Metal Finishes Manual.
  - 1. Metal Finishes Manual AMP 500
  - 2. Metal Stairs Manual AMP 510
  - 3. Pipe Railing Systems Manual AMP 521

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Shop drawings: Include plans, elevations, sections details and attachment to other work prepared by a qualified professional engineer licensed in the State of the project. Shop drawings shall be signed and sealed by the professional engineer.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Identify stairs in relation to floors and landing. Show details of construction, connections, and relation with handrails/guardrails.
3. Identify location of railings and railing systems. Show railings and railing systems including splices and attachments. Show details and dimensions not governed by field conditions. Indicate railings and railing systems in related and dimensioned position, with elevations at 1/4 in. scale and details at 3 in. scale or larger.
4. Indicate all required field measurements.
5. A full set of engineering calculations for all stair components and connections shall be submitted with the shop drawings. Calculations shall also bear a PE stamp and seal. Shop drawings shall not be reviewed without said calculations or PE stamped drawings.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. General: Engineer railing to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
  2. Steel: 72 percent of minimum yield strength.
- B. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  1. Uniform Load: 100lb/sq. ft.
  2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
  3. Uniform and Concentrated loads need not be assumed to act concurrently.
  4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
  5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- C. Structural Performance of Railings: This term includes both guard rail systems and handrails. Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  1. Handrails and Guard Rail Systems:
    - a. Uniform load of 50 lbf/ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
- D. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7, "Minimum Design Loads for Buildings and Other structures": Section 9, "Earthquake Loads" and the State Building Code.
  1. Component Importance Factor is 1.5.
- E. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

## 1.06 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.
- B. Handrail & Guard Rail design: Design guard rails and handrails and all joints and accessories for attaching to walls and other supports to be smooth and free of sharp edges or projections. Turn or otherwise treat handrails at ends in such a manner as to avoid projecting rail ends, catching of clothing and/or pinch points.
- C. National Association of Architectural Metal Manufacturers (NAAMM) Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual", for Commercial Class, unless more stringent requirements are indicated.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Deliver materials to job site in good condition and properly protected against damage to finished surfaces.
- D. Storage on site:
  - 1. Store material in a location and in a manner to avoid damage. Stack to prevent bending.
  - 2. Store aluminum, bronze, and stainless steel components and materials in clean, dry location, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting and provide for circulation of air inside covering.
- E. Keep handling on site to a minimum. Exercise particular care to avoid damage to finished materials.

## PART 2 PRODUCTS

## 2.01 METALS

- A. Steel and iron:
  - 1. Pipe, steel, black and hot-dipped, zinc-coated: ASTM A53, Type E, Grade A and B, Type S, Grade A and B.

## 2.02 MISCELLANEOUS MATERIALS

- A. Filler metal and welding electrodes:
  - 1. Provide filler metal and electrodes that yield weld metal of same composition as base metal to be welded, pursuant to applicable AWS specifications, metal manufacturer's recommendations for color match, strength, and compatibility in fabricated items.
  - 2. Check compatibility and match of filler metal with base metal prior to start of continuous welding operations.
  - 3. Store bare filler metal in dry and clean storage, pursuant to manufacturer's published instructions to avoid contamination.
- B. Fasteners: Same basic metal as fastened metal. Do not use metals which are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
- C. Anchors and inserts: Anchors of type, size, and material required for loading and installation condition shown, and recommended by manufacturer. Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use expansion bolt devices for drilled-in-place anchors.
- D. Primer paint for steel and iron: Manufacturer's standard rapid curing, rust-inhibiting primer; compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09 91 00 - Painting.

### 2.03 RAILINGS/GUARDRAIL/HANDRAILS

- A. Stair A Phase 2
  1. Handrail material: 1 ½" diameter maple handrail, stained to match doors
  2. Railing/Guardrail material: Galv. Steel
  3. Railing/Guardrail connections: Continuous butt welds ground smooth.
  4. Rail to post connections: Continuous fillet welds.
  5. Post mounting to sleeve anchors: Continuous fillet welds.
  6. Post mounting to stringers: Continuous fillet welds.
  7. Bracket for mounted handrails:
    - a. Julius Blum & Co., Inc. #2381 Galv. Steel with galv. steel fastener with bracket post adapter and anchor plug, or approved equal
    - b. Bracket anchorage: Framed walls and Stair Guardrail.
  8. Railing/Guardrail shapes, sizes:
    - a. 1 12" dia. posts
    - b. 1 12" dia. maple top rail, stained to match doors
    - c. 1" dia. rails
    - d. ½" x ½" square
    - e. 1/8" plate
  9. Grout fill: Non-shrink type.
- B. Stair B Phase 2
  1. Handrail material: 1 ½" diameter maple handrail, stained to match doors
  2. Railing/Guardrail material: Stainless Steel
  3. Railing/Guardrail connections: Continuous butt welds ground smooth.
  4. Rail to post connections: Continuous fillet welds.
  5. Post mounting to sleeve anchors: Continuous fillet welds.
  6. Post mounting to stringers: Continuous fillet welds.
  7. Bracket for mounted handrails:
    - a. Julius Blum & Co., Inc. #220 and #374 Satin Finish Stainless Steel with stainless steel fastener with bracket post adapter and anchor plug.
    - b. Bracket anchorage: Framed walls and Stair Guardrail.
  8. Top Rail Mouldings:
    - a. Julius Blum & Co., Inc. #6502 Satin Finish Stainless Steel with stainless steel fastener with bracket post adapter and anchor plug, or approved equal
  9. Railing/Guardrail shapes, sizes:
    - a. 2 1/4" maple Top Rail, stained to match doors
    - b. 3/4" x 1 1/2" rectangular top and bottom rail for spindles
    - c. x " ½" square spindles
    - d. ½" x ½" square
    - e. 1/8" plate
  10. Post shapes, sizes:

- a. 1 1/2" x 1 1/2" square posts
- 11. Grout fill: Non-shrink type.
- C. Stair & Mezzanine Guardrail Both Phase 1 & 2
  - 1. Railing/Guardrail/Handrail material: Galvanized Steel.
  - 2. Railing connections: Continuous butt welds ground smooth.
  - 3. Rail to post connections: Continuous fillet welds.
  - 4. Post mounting to sleeve anchors: Continuous fillet welds.
  - 5. Post mounting to stringers: Continuous fillet welds.
  - 6. Bracket for mounted handrails:
    - a. Material: Match railing material and finish.
    - b. Bracket anchorage: CMU and Guard Rail Posts
  - 7. Railing/Guardrail shapes, sizes
    - a. Toprail: Round, tubular.
      - 1) Size 1 1/2"
    - b. Bottom rail: Round, tubular.
      - 1) Size 1 1/2"
    - c. Railing Insert:
      - 1) 8.5 gauge Woven wire mesh fabric with 2" x 2" square pattern, painted. Each termination of the woven wire mesh fabric shall be securely fastened to the steel U-channel for the entire perimeter of each panel. Contractor may either crimp the mesh into the U-channel or weld at every mesh end point.
  - 8. Post shapes, sizes:
    - a. Round, tubular; 1-1/2 in.
  - 9. Stair tread non-slip abrasive tape:
    - a. 3M Super Anti-Slip Abrasive Tape.
    - b. 3" wide x width of tread.
    - c. Color as selected by Architect to be visually contrasting.

#### 2.04 FABRICATION

- A. Form rail-to-end post connections and changes in rail direction.
- B. Remove burrs from exposed cut edges.
- C. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends.
- D. Locate intermediate rails and balusters (pickets) pursuant to code.
- E. Close exposed ends of pipe, tube and channel by welding metal closure in place or by use of approved prefabricated fittings.
- F. For posts set in concrete, furnish matching sleeves or inserts not less than 5 in. long.
- G. Welding:
  - 1. Thoroughly fuse without undercutting or overlap.
  - 2. Remove spatter, grind exposed welds where necessary,
    - a. and contour surfaces to match those adjacent.
  - 3. Discoloration of finished surfaces will not be acceptable.
- H. Fabricate joints which will be exposed to the weather so as to exclude water or provide weep holes where water may accumulate.



- I. Fabricate all-welded shop assemblies in as large sections as possible

## 2.05 STEEL-FRAMED STAIR

- A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, handrails, railing systems, newels, balusters, struts, clips, brackets, bearing plates or other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.
  1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for class of stair designated, except where more stringent requirements are indicated.
    - a. Commercial class, unless otherwise indicated.
- B. Stair Framing: Fabricate stringers of structural steel channels and tubes as shown. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel and/or tube headers and miscellaneous forming members. Bolt or weld headers to stringers; and bolt or weld newels and framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.
- C. Metal Pan Risers, Sub-treads and Sub-platforms: Shape metal pans for risers and sub-treads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required, to support total design loading.
  1. Form metal pans of uncoated hot-rolled steel sheet, unless otherwise indicated.
  2. Attach risers and sub-treads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting or bolting.
  3. Provide sub-platforms of configuration and construction indicated; if not indicated, of same metal as risers and sub-treads, in thicknesses required to support design loading. Attach sub-platform to platform framing members with welds. Provide tube steel posts for support of platforms where shown on drawings.
- D. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and over stressing of substrate.

## 2.06 FINISHES

- A. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installing anchorages, including concrete inserts, weld plates and anchor bolts. Coordinate delivery of such items to Project site.

### 3.02 INSTALLATION

- A. Anchor handrail and railing systems pursuant to ASTM E894.
- B. Setting posts/grout:
  1. Clean dust and foreign matter from sleeves.

2. Moisten interior of holes and surrounding surfaces with clean water.
  3. Prepare and use specified grout fill pursuant to manufacturer's published instructions.
  4. Place railing in position and brace until grout sets.
  5. Pour mixture into annular space until it overflows the hole.
  6. Wipe off excess and leave 1/8 in. build-up, sloped away from post.
- C. Set posts plumb and aligned to within 1/4 in. in 12 ft.
- D. Set rails horizontal or parallel to rake of steps or ramp to within 1/4 in. in 12 ft.
- E. Support wall handrails on brackets spaced not more than 6 feet for steel sections.
1. Handrail clearance at wall: The space between the wall side of a handrail and the wall surface, e.g., the rail clearance, shall be not less than 1-1/2 in. Handrail shall project no more than 3-1/2 in. into required stair width. Rail ends returned to wall shall terminate not more than 1/4 in. from wall.
  2. Handrail ends at top and bottom of stairs: The handrail at the upper and lower ends of stairs or ramps shall extend a horizontal distance of 12 in. beyond the intersection of the nosing line or ramp surface with the adjacent surface pursuant to ASTM E985.

### 3.03 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installing steel stairs. Set units accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; and measured from established lines and levels.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted field connections.
- D. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- E. Stair Installation Tolerances:
1. Maximum variation from plumb: 1/4 inch per story, noncumulative.
  2. Maximum offset from true alignment: 1/4 inch.

### 3.04 CLEANING AND TOUCH-UP PAINTING

- A. Cleaning
1. Immediately after erection, clean field welds, bolted connections, any and all areas showing any rust and areas where shop paint has been abraded. Clean all members of all mud, dirt and dust.
- B. Touch-up

1. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

**END OF SECTION 055100**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Steel ladder.
- B. Attachment hardware.

## 1.02 RELATED SECTIONS

- A. Section 055000 - Metal Fabrications.

## 1.03 REFERENCES

- A. ANSI A14.3 - Ladders-Fixed-Safety Requirements
- B. ASTM A36 - Structural Steel.
- C. ASTM A108 - Steel Bars, Carbon, Cold Finished, Standard Quality.
- D. AWS A2.0 - Standard Welding Symbols.
- E. AWS D1.0 - Code for Welding in Building Construction.
- F. AWS D1.1 - Structural Welding Code.
- G. OSHA 1910.27 - Fixed Ladders.

## 1.04 DESIGN REQUIREMENTS

- A. Fabricate ladder assembly to support concentrated live load of 250 lb (1100 N) acting anywhere on the ladder with a maximum deflection of 1/240 of span and without damage or permanent set.
- B. Fabricate ladder assembly to support a concentrated live load of 80 lb (350 N) acting on each rung simultaneously with a maximum deflection of 1/240 of span and without damage or permanent set.

## 1.05 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, fastener size and type, and accessories. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Instructions: Indicate special procedures and methods required for proper installation of the safety climbing system and vandal deterrent.

## 1.06 QUALITY ASSURANCE

- A. Fabricate ladder in accordance with ANSI A14.3, OSHA 1910.27, AWS D1.0, and AWS D1.1.
- B. Maintain one (1) copy of each document on site.

### 1.07 QUALIFICATIONS

- A. Prepare shop drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the project is located. The shop drawings shall be signed and sealed by the Professional Structural engineer.
- B. Installer: Company specializing in performing the work of this section with a minimum of three (3) years documented experience.

### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products to the site under provisions of Section 016500.
- B. Fabricate and deliver products to the site in largest sections practical.
- C. Do not handle products in a manner that will damage or distort ladder.
- D. Do not store materials directly on the ground.

### 1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on approved shop drawings.

### 1.10 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate installation of ladder with the installation or fabrication of substrate and all other adjacent work.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Rungs: ASTM A108 round steel bars; minimum 1 inch (25.4 mm) diameter (#8 rebar) and minimum 18 inch (457.2 mm) length.
- B. Side Rails: ASTM A36 flat steel plate; minimum 3/8 inch (9.5 mm) thick.
- C. All components to be hot dipped galvanized

### 2.02 FABRICATION - GENERAL

- A. Fit and assemble in largest practical sections for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Continuously seal jointed pieces with continuous welds in accordance with AWS D1.0 and D1.1.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush, countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Accurately form components required for anchorage of ladder and accessories to each other and to structure.

### 2.03 FABRICATION - LADDER

- A. Fabricate ladder with rungs spaced at 12 inches (300 mm) on center. Minimum rung length to be 18 inches (410 mm) (Clearance between siderails).
- B. Install attachment hardware such that the centerline of the rungs is a minimum of 7 inches (180 mm) from any structure, measured perpendicular to the ladder.
- C. Extend side rails a minimum of 42 inches (1,070 mm) above any platforms and landings.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify existing conditions.
- B. Verify that field conditions are acceptable and are ready to receive work.
- C. Beginning of installation means erector accepts existing conditions.

### 3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be bolted or welded to steel with setting templates, to appropriate sections.

### 3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting ladder to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Field weld components indicated on approved shop drawings. Perform field welding in accordance with AWS D1.1. Provide a fire watch during all welding operations.
- E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- G. Obtain Engineer approval prior to site cutting or making adjustments not scheduled.

### 3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) in 10 feet (3 m), non-cumulative.

- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.05 DEMONSTRATION

- A. Demonstrate operation and use of safety climbing system to Owner's representatives once system is installed.

3.06 PROTECTION

- A. Protect finished work from damage until project is accepted by the Owner.

**END OF SECTION 055133.13**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Treated Wood Members.
  - 2. Miscellaneous Framing and Sheathing.
  - 3. Fasteners.
  - 4. Structural Hold Downs, Connectors and Framing Accessories.
  - 5. Wood blocking, cants, and nailers.
  - 6. Wood furring and grounds.

## 1.03 REFERENCES:

- A. AWP - (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.
- B. APA - American Plywood Association.
- C. AITC - American Institute of Timber Construction.
- D. US Department of Commerce (DOC):
  - 1. DOC PS 1 - Performance Standard for Structural Plywood.
  - 2. DOC PS 2 - Performance Standard for Wood-Based Structural Panels.
- E. International Code Council (ICC):
  - 1. ICC IBC - International Building Code

## 1.04 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. SPIB: The Southern Pine Inspection Bureau.
  - 4. WCLIB: West Coast Lumber Inspection Bureau.
  - 5. WWPA: Western Wood Products Association.

## 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.



2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
  1. Wood-preserved-treated wood.
  2. Fire-retardant-treated wood.
  3. Plywood.
  4. Engineered wood products.
  5. Shear panels.
  6. Power-driven fasteners.
  7. Powder-actuated fasteners.
  8. Expansion anchors.
  9. Metal framing anchors.

#### 1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle, Transport and Store Plywood Panels in accordance with the APA Storage and Handling recommendations.
- B. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- C. Stack panels flat with a minimum of three, full panel width, 4 inch by 4 inch spacers per eight foot panel length beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

## 2.01 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:
1. Dimension lumber framing.
  2. Timber.
  3. Laminated-veneer lumber.
  4. Parallel-strand lumber.
  5. Miscellaneous lumber.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  4. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness 15 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness unless otherwise indicated.
- D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- E. Plywood: Conform to requirements and recommendations provided in DOC PS 1 - Voluntary Product Standard for Construction and Industrial Structural Plywood.

## 2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; UC2 (Interior Construction - Above Ground - Damp) for interior construction not in contact with the ground, Use Category UC3B (Above Ground Exposed) for exterior construction not in contact with the ground, and UC4B (Ground Contact or Fresh Water - Heavy Duty) for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
  2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
  - 5. Wood floor plates that are installed over concrete slabs-on-grade.

### 2.03 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
  - 3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency. Mark panels on surfaces that will not be exposed in the final construction.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
  - 1. Concealed blocking.
  - 2. Framing for non-load-bearing exterior walls.
  - 3. Roof construction.

## 2.04 CONSTRUCTION MOUNTING PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1, APA rated A-D faced plywood or MDF; 3/4 inch thick; flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

## 2.05 ENGINEERED WOOD PRODUCTS

- A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.
- B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Georgia-Pacific.
    - b. Louisiana-Pacific Corporation.
    - c. Weyerhaeuser Company
    - d. Or approved equal.
  - 2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal depth members.
  - 3. Modulus of Elasticity, Edgewise: 1,900,000 psi .
- C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D2559

## 2.06 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
  - 1. Hem-fir (north); NLGA.
  - 2. Mixed southern pine; SPIB.
  - 3. Hem-fir; WCLIB or WWPA.
  - 4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
  - 1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
  - 2. Eastern softwoods; No. 2 Common grade; NeLMA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.07 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.
- B. Power-Driven Fasteners: NES NER-272.
- C. Wood Screws: ASME B16.1.
- D. Lag Bolts: ASME B18.2.1.
- E. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.
- F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E488/E488M conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

## 2.08 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cleveland Steel Specialty Co.
  - 2. Simpson Strong-Tie Co., Inc.
  - 3. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Provide products that have been approved by the ICC-Evaluation Service with an accompanying Evaluation Service Report (ESR) listing locations of allowable use.
- D. Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges at least 85 percent of joist depth.
  - 1. Thickness: 0.062 inch.
- E. I-Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
  - 1. Thickness: 0.062 inch.

- F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
  - 1. Strap Width: 1-1/2 inches.
  - 2. Thickness: 0.062 inch.
- G. Bridging: Rigid, V-section, nail-less type, 0.050 inch thick, length to suit joist size and spacing.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
  - 1. Width: 1-1/4 inches.
  - 2. Thickness: 0.062 inch.
  - 3. Length: As indicated.
- I. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fasteners to side of rafter or truss, face of top plates, and side of stud below.
- J. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.
- K. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.
- L. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
  - 1. Bolt Diameter: 3/4 inch.
  - 2. Width: 3-3/16 inches.
  - 3. Body Thickness: 0.138 inch.
  - 4. Base Reinforcement Thickness: 0.108 inch.
- M. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch deep by 0.034 inch thick with hemmed edges.
- N. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch thick with hemmed edges.

## 2.09 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

## PART 3 - EXECUTION

### 3.01 PREPARATION OF SURFACES

- A. Surfaces to receive new wood members shall be free of all dirt, debris, and loose materials. Exposed surfaces shall be mechanically scraped if necessary, to remove projections.
- B. Surfaces shall have no free water present in any form (rain, dew, frost, snow or ice).

- C. Contractor is responsible to inspect all exposed surfaces to see that conditions are satisfactory for installation of new work.

### 3.02 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Place horizontal members flat, crown side up.
- E. Construct load bearing framing and curb members full length without splices.
- F. Double members at all openings. Space short members over and under opening to member spacing.
- G. Bridge framing in excess of 8 feet span at midspan.
- H. Coordinate installation of adjacent construction.
- I. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- J. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- K. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- L. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- M. Do not splice structural members between supports unless otherwise indicated.
- N. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- O. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not

- inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- P. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- Q. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
  2. Table 2304.10.1, "Fastening Schedule," in ICC's "International Building Code" and the 2020 Building Code of New York State".
  3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- R. Warped wood members shall not be used unless they can be fastened adequately to permanently hold them in their required alignment.
- S. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
  2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
  3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

### 3.03 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.04 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

### 3.05 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing



on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal size wood studs spaced 24 inches o.c. unless otherwise indicated.
  2. For interior partitions and walls, provide 2-by-4-inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.
- B. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
  2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R602.7(1) or Table R602.7(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings.

### 3.06 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
1. Where supported on wood members, by toe nailing or by using metal framing anchors.
  2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with 1/4-by-1-1/4 inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
- H. Provide solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

- J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
  - 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal size lumber, double-crossed and nailed at both ends to joists.
  - 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

### 3.07 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
  - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
  - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

### 3.08 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
  - 1. Size: 2-by-12-inch nominal size, minimum.
  - 2. Material: solid lumber.
  - 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
  - 4. Spacing: At least three framing members for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

### 3.09 TOLERANCES

- A. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

### 3.10 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION 061000**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Wall sheathing.
  - 2. Roof sheathing.
  - 3. Sheathing joint and penetration treatment.

## 1.03 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
  - 1. ASME B18.6.1 - Wood Screws (Inch Series).
- B. ASTM International (ASTM):
  - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - 2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials
  - 3. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings
  - 4. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials
  - 5. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- C. US Department of Commerce (DOC):
  - 1. DOC PS 2 - Performance Standard for Wood-Based Structural Panels.
- D. International Code Council (ICC):
  - 1. ICC IBC - International Building Code.
- E. ICC Evaluation Service, Inc. (ICC-ES):
  - 1. AC38 - Acceptance Criteria for Weather Resistive Barriers
  - 2. ICC-ES AC116 - Acceptance Criteria for Nails and Spikes
  - 3. ICC-ES AC148 - Acceptance Criteria For Flexible Flashing Materials
- F. International Association of Plumbing and Mechanical Officials (IAPMO):

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:
  - 1. Preservative-treated plywood.
  - 2. Fire-retardant-treated plywood.
  - 3. Plywood Sheathing.
  - 4. Seam Tape.
- B. Product Certifications: From manufacturer, indicating that sheathing products comply with ICC ES AC266 and ICC-ES AC310.

## 1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle, Transport and Store Plywood Panels in accordance with the APA Storage and Handling recommendations.
- B. Stack panels flat with a minimum of three, full panel width, 4 inch by 4 inch spacers per eight foot panel length beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

## 2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory".

## 2.02 WOOD PANEL PRODUCTS

- A. Plywood: DOC PS 1 - Voluntary Product Standard for Construction and Industrial Structural Plywood.
- B. Oriented Strand Board: DOC PS 2, made with binder containing no added urea formaldehyde.
- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

## 2.03 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC3b for exterior construction not in contact with the ground and Use Category UC4a for items in contact with the ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

## 2.04 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F (76 deg C) shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
  - 1. Roof and wall sheathing within 48 inches (1220 mm) of fire walls.
  - 2. Roof sheathing.
  - 3. Subflooring and underlayment for raised platforms.

## 2.05 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. CertainTeed Corporation; GlasRoc.
    - b. G-P Gypsum Corporation; Dens-Glass Gold.
    - c. National Gypsum Company; Gold Bond e(2)XP.
    - d. United States Gypsum Co.; Securock.
  - 2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
  - 3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.
- B. Cementitious Backer Units: ASTM C1325, Type A.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. USG Corporation; DUROCK Cement Board.
    - b. Or approved equal.
  - 2. Thickness: 1/2 inch (12.7 mm).

## 2.06 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
  - 1. Span Rating: Not less than 24/0.
  - 2. Nominal Thickness: Not less than 3/4 inch (19 mm).

## 2.07 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel..
- B. Nails, Brads, and Staples: ASTM F1667, ICC AC116 and ICC AC201.
- C. Power-Driven Fasteners: ICC-ES-1539 or NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
  - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
  - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C1002.
  - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C954.

## 2.08 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 - JOINT SEALANTS.
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
  - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- C. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive, meeting ICC-ES AC148, and tested as part of an assembly meeting performance requirements.
  - 1. Basis-of-Design Product: Provide Huber Engineered Woods; ZIP System Tape or approved equal.

2. Thickness: 0.012 inch (0.3 mm).

## 2.09 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

## PART 3 - EXECUTION

### 3.01 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. NES NER-272 for power-driven fasteners.
  2. Table 2304.10.1, "Fastening Schedule," in ICC's "International Building Code" and the 2020 Building Code of New York State".
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.02 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  1. Wall and Roof Sheathing:
    - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
- C. Air and Moisture Barrier: Coordinate sheathing installation with flashing and joint sealant sequencing and installation and with adjacent building air and moisture barrier components to provide complete, continuous air- and moisture- barrier.
- D. Do not bridge expansion joints; allow joint spacing equal to spacing of structural supports.



- E. Install panels with laminated facer to exterior. Stagger end joints of adjacent panel runs. Support all panel edges.
  - 1. Space square-edged panels 0.125 inch (3 mm).
  - 2. Butt edges of self-spacing edge panels.
- F. Roof Sheathing Panel Clips: Where required under code approvals based upon panel thickness and support spacing, provide panel clips located at each unsupported panel butt joint centered between supports.
- G. Apply ZIP System Tape at all panel seams, penetrations, and facer defects or cracks to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of ICC-ES applicable to tape application.

### 3.03 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
  - 1. Fasten gypsum sheathing to wood framing with screws.
  - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
  - 3. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
  - 4. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
  - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards unless a tighter spacing is required by Structural Drawings
  - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
  - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards unless a tighter spacing is required by Structural Drawings.
  - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
  - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

**END OF SECTION 061600**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes, but not limited to, the following:
  - 1. Casings, trims, and chair rails.
  - 2. Wood corner guards.
  - 3. Closet shelving and rods.
  - 4. Wood window sills.
  - 5. Decorative Casings
  - 6. Wood Base
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 061000 - Rough Carpentry for furring, blocking, and other carpentry work not exposed to view.
  - 2. Section 081429 - Pre-finished Wood Doors.
  - 3. Section 092900 - Gypsum Board.
  - 4. Section 099100 - Painting.

## 1.03 REFERENCES

- A. Standards: Comply with the following unless otherwise specified or indicated on the Drawings:
  - 1. Lumber: American Softwood Lumber Standard PS 20 by the U.S. Department of Commerce. Comply with applicable provisions for each indicated use.
  - 2. Plywood: Product Standard PS 1 for Softwood Plywood, Construction and Industrial by the U.S. Department of Commerce.
  - 3. Plywood Installation: APA Design/Construction Guide, Residential & Commercial by the American Plywood Association (APA).
  - 4. Grading Rules:
    - a. Douglas Fir, Hem-Fir, Idaho White Pine, and other Western Woods: Western Wood Products Association (WWPA) or West Coast Lumber Inspection Bureau (WCLIB).
    - b. Southern Pine: Southern Pine Inspection Bureau (SPIB).
    - c. Redwood: Redwood Inspection Service (RIS).
    - d. Spruce-Pine-Fir: National Lumber Grades Authority (NLGA).

## 1.04 SUBMITTALS

- A. Submit following pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016100 - Product Requirements.
- C. Samples:
  - 1. Provide three (3) samples for approval of each different style and finish wood product specified. Once approved, two samples shall be stained and finished with required polyurethane for color approval.
- D. Shop Drawings:
  - 1. Provide shop drawings to show termination and transition details for wood wainscot, wood base and/or wood chair rail including but not limited to the following conditions:
    - a. Outside corners.

- b. Expansion joints.
- c. Terminations at door frames and window openings.
- d. Terminations at miscellaneous wall interruptions including but not limited to: electrical devices, fire extinguisher cabinets, mail boxes, display cases and other wall mounted items.

#### 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this Section.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Keep lumber, paneling and plywood dry by elevating above dampness, so that air can circulate, and warping will not occur, and by covering with waterproof film that permits circulation of air to all parts of each pile.
- D. Do not stack any finish carpentry materials outside.

#### 1.07 DEFINITIONS

- A. Abbreviations:
  - 1. PPT: Pressure preservative treated.
  - 2. E: Modulus of elasticity.
  - 3. Fb: Extreme fiber stress in bending.
  - 4. RFS: Rough full sawn.
  - 5. S4S: Surfaced four sides.

#### 1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install finish carpentry materials until building is enclosed, wet work is complete, dust creating activities are finished, all walls are prime painted, and HVAC System is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

### PART 2 PRODUCTS

#### 2.01 WOOD WINDOW SILLS

- A. Furnish and install hard maple windowsills at all locations shown on the drawings. (Exclude the Apparatus Bay).
  - 1. Sills Greater in width than 8" shall be Kerf cut.
  - 2. All sills shall be stained to match wood doors and finished with three (3) coats of polyurethane.
  - 3. Quality: Clear - (3% Maximum moisture content)

#### 2.02 CORNER GAURDS

- A. Furnish and install hard maple corner guards in Meeting Room 116
  - 1. Material sizes and shapes as indicated in section 102613 - CORNER GUARDS.
  - 2. All corner guards shall be stained to match wood doors and finished with three (3) coats of polyurethane.

3. Quality: Clear - (3% Maximum moisture content)
4. Provide continuous solid blocking in wall and attach chair rail at 8" o.c. minimum.

### 2.03 CHAIR RAIL

- A. Furnish and install hard maple chair rail as indicated on drawings.
  1. Material sizes and shapes as indicated on drawings.
  2. All chair rails shall be stained to match wood doors and finished with three (3) coats of polyurethane.
  3. Quality: Clear - (3% Maximum moisture content)
  4. Provide continuous solid blocking in wall and attach chair rail at 8" o.c. minimum.
- B. Furnish and install hard maple chair rail in Room(s) Meeting Room 116, Conference Room 202, and all second floor offices.
  1. Sizes: as indicated on Contract Drawings.
  2. Profile: as indicated on Contract Drawings.
  3. All chair rails shall be stained to match wood doors and finished with three (3) coats of polyurethane.
  4. Quality: Clear - (3% Maximum moisture content)
  5. Provide continuous solid blocking in wall and attach chair rail at 8" o.c. minimum.

### 2.04 WINDOW CASING

- A. Hard Maple Window Casing:
  1. Size: as indicated on Contract Drawings.
  2. Profile: as indicated on Contract Drawings.
  3. All window casing shall be stained to match wood doors and finished with three (3) coats of polyurethane.
  4. Quality: Clear - (3% Maximum moisture content)
  5. Provide continuous solid blocking in wall and attach casing at 8" o.c. minimum.

### 2.05 WOOD BASE

- A. Wood Base and Shoe:
  1. Size and shape as indicated on Contract Drawings.
  2. All wood base shall be stained to match wood doors and finished with three (3) coats of polyurethane.
  3. Quality: Clear - (3% Maximum moisture content)
  4. Provide continuous solid blocking in wall and attach base at 8" o.c. minimum.

### 2.06 CLOSETS

- A. Unless otherwise indicated, every closet shall have a fully secured 5/4" thick wood shelf and full-length closet rod.
  1. Shelf shall be primed and painted two coats.

### 2.07 DISPLAY CASE DECORATIVE CASINGS

- A. Furnish and install hard maple, casings at all locations shown on the drawings.
  1. Size: 3/4" x 4".
  2. Material: Hard maple
  3. Finish: Stained to match doors.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 72 hours, unless longer conditioning is recommended by manufacturer.
- C. Prime lumber for applications to be painted and/or stained, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 09 Section - "Painting."

## 3.03 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
  - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 4. No unfinished edges or ends are allowed in Finish Carpentry or Finish Carpentry systems.
  - 5. All wood joints shall be mitered.
  - 6. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

## 3.04 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
  - 1. Match color and grain pattern across joints.
  - 2. Install trim after gypsum board joint finishing operations are completed and all surfaces have received paint primer at a minimum.
  - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
  - 4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.05 ADJUSTING

- A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.06 CLEANING

- A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up finishes to restore damaged or soiled areas.

**END OF SECTION 062000**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Factory finishing.
- E. Preparation for installing utilities.

## 1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 123661 - Quartz Surfacing Countertops.
- C. Section 123661.16 - Solid Surfacing Countertops.

## 1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.
- E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- F. UL (DIR) - Online Certifications Directory; Current Edition.
- G. WI (CSIP) - Certified Seismic Installation Program (CSIP); Current Edition.
- H. WI (MCP) - Monitored Compliance Program (MCP); Current Edition.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

## 1.05 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
  - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
  - 3. Include certification program label.



- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 8 inches (200 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

#### 1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
  - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification: Comply with WI (CSIP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
  - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
  - 2. Provide designated labels on shop drawings as required by certification program.
  - 3. Provide designated labels on installed products as required by certification program.
  - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
  - 5. Replace, repair, or rework all work for which certification is refused.

#### 1.07 MOCK-UP

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Mock-up may remain as part of the Work.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

#### 1.09 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

### PART 2 PRODUCTS

#### 2.01 WOOD CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Wood Veneer Faced Cabinet:
  - 1. Exposed Surfaces: HPVA HP-1 Grade A, Maple, plain sliced, pleasing-matched or as selected by the Owner.
  - 2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Maple, plain sliced, pleasing-matched.

3. Concealed Surfaces: HPVA HP-1 Grade C, Maple, plain sliced, pleasing-matched.
- C. Cabinets at Kitchen 118 and Meeting Room 116:
  1. Finish - Exposed Exterior Surfaces: Wood.
  2. Finish - Exposed Interior Surfaces: Decorative laminate.
  3. Finish - Concealed Surfaces: Manufacturer's option.
  4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
  5. Casework Construction Type: Type B - Face-frame.
  6. Interface Style for Cabinet and Door: Style 2 - Finish Inset; reveal overlay.
  7. Adjustable Shelf Loading: 50 lbs. per sq. ft.
    - a. Deflection: L/144.
  8. Cabinet Style: Reveal overlay on face frame or as selected by the Owner.
  9. Cabinet Doors and Drawer Fronts: Stile and rail, flat panel style or as selected by the Owner.
  10. Drawer Side Construction: Multiple-dovetailed.
  11. Drawer Construction Technique: Dovetail joints.

## 2.02 KITCHEN ISLAND CASEWORK

- A. Island in Kitchen 118:
  1. CABINETS: As described in section 2.01C
  2. COUNTER TOP: Top shall be constructed of  $\frac{3}{4}$ " luan plywood and covered with Quartz Solid Surface.
  3. BAR FOOT RAIL: Bar foot rail shall consist of 2" O.D. diameter stainless steel tubing, satin finish. Provide brushed stainless steel combination foot rail brackets at each end of rail and at 4' o.c..
  4. FINISH: Stain and polyurethane finish to match cabinets, Hard Maple.
  5. ELECTRICAL: Coordinate with 'E' drawings for electrical and data cut outs.

## 2.03 BATHROOM VANITY

- A. Vanity at Bathrooms 127 and 128:
  1. COUNTER TOP: Counter top shall be constructed of  $\frac{3}{4}$ " luan plywood and covered with  $\frac{3}{4}$ " thick solid surface (Quartz) with a bullnose profile as detailed on drawings. Coved backsplash and sidesplash.
  2. INTEGRAL SINK: Color white; seamed undermount.
  3. LOWER PANEL: Removable  $\frac{1}{2}$ " solid surface panel.

## 2.04 LAMINATE CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Cabinets at Laundry Room 106, Training Room 206, Company Kitchen 203B:
  1. Finish - Exposed Exterior Surfaces: Decorative laminate.
  2. Finish - Exposed Interior Surfaces: Decorative laminate.
  3. Finish - Concealed Surfaces: Manufacturer's option.
  4. Door and Drawer Front Retention Profiles: Fixed panel.
  5. Casework Construction Type: Type B - Face-frame.
  6. Interface Style for Cabinet and Door: Style 2 - Finish Inset; reveal overlay.
  7. Adjustable Shelf Loading: 50 lbs. per sq. ft.
    - a. Deflection: L/144.
  8. Cabinet Style: Reveal overlay on face frame or as selected by the Owner.
  9. Cabinet Doors and Drawer Fronts: Flush style or as selected by the Owner.
  10. Drawer Side Construction: Multiple-dovetailed.

11. Drawer Construction Technique: Dovetail joints.

## 2.05 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.
- C. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

## 2.06 LAMINATE MATERIALS

- A. Manufacturers:
  1. Formica Corporation; \_\_\_\_: [www.formica.com](http://www.formica.com).
  2. Wilsonart; \_\_\_\_: [www.wilsonart.com](http://www.wilsonart.com).
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

## 2.07 COUNTERTOPS

- A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
  1. See Section 123661.16 - SOLID SURFACING COUNTERTOPS.
  2. See Section 123661 - QUARTZ SURFACING COUNTERTOPS.

## 2.08 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
  1. Manufacturers:
    - a. Franklin International, Inc; Titebond Original Wood Glue: [www.titebond.com/sle](http://www.titebond.com/sle).
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
  1. Color: As selected by Architect/Engineer from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Concealed Joint Fasteners: Threaded steel.
- F. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

## 2.09 HARDWARE

- A. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, Brushed Nickel finish, for nominal 1 inch (25 mm) spacing adjustments.

- B. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers ("U" shaped wire pull, steel with satin finish, 100 mm centers).
- C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
- D. Catches: Touch type.
- E. Drawer Slides:
  - 1. Type: Full extension with overtravel.
  - 2. Static Load Capacity: Commercial grade.
  - 3. Mounting: Side mounted.
  - 4. Stops: Integral type.
  - 5. Features: Provide self closing/stay closed type.
  - 6. Manufacturers:
    - a. Accuride International, Inc: [www accuride.com](http://www accuride.com).
    - b. Grass America Inc: [www.grassusa.com](http://www.grassusa.com).
    - c. Knappe & Vogt Manufacturing Company: [www.knappeandvogt.com](http://www.knappeandvogt.com).
- F. Hinges: European style concealed self-closing type, steel with satin finish.
  - 1. Manufacturers:
    - a. Grass America Inc: [www.grassusa.com](http://www.grassusa.com).
    - b. Blum, Inc; \_\_\_\_\_: [www.blum.com](http://www.blum.com).
- G. Sliding Door Track Assemblies: Upper and lower track of satin anodized aluminum, with matching shoe equipped with nylon rollers.

## 2.10 SHOP TREATMENT OF WOOD MATERIALS

- A. Provide UL (DIR) listed and approved identification on fire retardant treated material.
- B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

## 2.11 SITE FINISHING MATERIALS

- A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

## 2.12 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (600 mm) from sink cut-outs.
  - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
  - 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

- E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
  - 1. Provide center matched panels at each elevation.
  - 2. Provide sequence matching across each elevation.
  - 3. Carry figure of cabinet fronts to toe kicks.
- F. Mechanically fasten back splash to countertops at 16 inches (400 mm) on center.
- G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.
- H. Shop glaze glass materials using the Interior Dry method as specified in Section 088000.

## 2.13 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
- C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
  - 1. Transparent:
    - a. System - 11, Polyurethane, Catalyzed.
    - b. Stain: As selected by Architect/Engineer.
    - c. Sheen: Satin.
    - d. Products:
      - 1) Sherwin-Williams Sayerlack® Premium Polyurethane Clear Topcoat, TZL71 Series, AWI Finishing System 11.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

### 3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.

- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

**3.03 ADJUSTING**

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

**3.04 CLEANING**

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

**END OF SECTION 064100**

## PART 1 – GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes, but not limited to, the following:
  - 1. Cellular PVC trim boards for frieze boards, rake boards, louver/door/window trim and other trim boards as shown on the Contract Drawings.

## 1.03 STANDARDS

- A. ASTM D570 - "Standard Test method for Water Absorption of Plastics".
- B. ASTM D638 - "Standard Test method for Tensile Properties of Plastics".
- C. ASTM D792 - "Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement".
- D. ASTM E84 - "Standard Test Method for Surface Burning Characteristics of Building Materials".

## 1.04 SUBMITTALS

- A. Submit following pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data: Manufacturer's data sheets on each product to be used, including but not limited to:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation instructions and methods.
  - 4. Code Compliance Reports.
- D. Samples:
  - 1. For each product specified, two (2) samples, minimum size 6 inches long, representing actual product, color and finish.
- E. Warranty:
  - 1. Submit sample warranty meeting the requirements specified in the "Warranty" paragraph below.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum of 10 years experience producing PVC trim products.
- B. Regulatory Requirements:
  - 1. Class A (Class 1) Flame Spread Classification.
  - 2. Meet ICC and CCMC code requirements.
- C. ALLOWABLE TOLERANCES:
  - 1. Variation in component length: Minus 0.00/plus 1.00".

2. Variation in component width: +/- 1/16".
3. Variation in component thickness: +/- 1/16".
4. Variation in component edge cut: +/- 2 degrees.
5. Variation in Density: -0% + 10%.

D. Workmanship, Finish, and Appearance:

1. Free foam cellular PVC that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square, and top and bottom surfaces shall be flat with no convex or deviation.
2. Uniform surface free from cupping, warping and twisting.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Trim materials should be stored on a flat and level surface on a full shipping pallet.
- B. Handle materials to prevent damage to product edges and corners.
- C. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

#### 1.07 WARRANTY

- A. Provide manufacturer's minimum 20 year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

### PART 2 – PRODUCTS

#### 2.01 MATERIALS

- A. Acceptable products:
  1. AZEK® Trim Boards manufactured by The Azek® Company, 999 N. Keyser Ave., Scranton, PA 18508, Phone: (570) 558-8000.
  2. CERATRIM® Cellular PVC Trim Boards by CertainTeed Corp., 20 Moores Road, Malvern, PA 19355, Phone: (800) 233-8990.
  3. VERSATEX, 400 Steel St., Aliquippa, PA 15001, Phone: (724) 857-1111.
  4. Architect approved equivalent.

#### 2.02 MATERIAL

- A. Free foam cellular PVC material with a small cell microstructure.
  1. Density: 0.55 grams/cubic centimeter when tested in accordance with ASTM D 792.
  2. Water Absorption: Less than 0.50 percent when tested in accordance with ASTM D 570.
  3. Tensile Strength: 3582 psi when tested in accordance with ASTM D 638.

#### 2.03 SIMULATED WOOD TRIM

- A. PVC Trim Boards: Trim boards with sealed edge, designed with a natural appearance.
  1. Size: Width and thickness as shown on Contract Drawings.
  2. Finish: Reversible with traditional (smooth) woodgrain finish.

#### 2.04 ACCESSORY PRODUCTS

- A. Fasteners:
  1. Use fasteners designed for cellular PVC trim and wood siding (thinner shank, blunt point, full round head).
  2. Use stainless steel fasteners.



3. Staples, small brads and wire nails must not be used as fastening members.
  4. The Fasteners should be long enough to penetrate the substrate a minimum of 1-1/2". All fasteners must be countersunk.
  5. Use two (2) fasteners per framing member for trim board applications.
  6. Fasteners must be installed no more than 2" from the end of each board.
  7. PVC Cellular Trim products should be fastened into a flat, solid substrate. Fastening Cellular PVC Trim products into hollow or uneven areas must be avoided.
- B. Adhesives:
1. Glue all Cellular PVC to Cellular PVC joints such as window surrounds, long fascia runs, etc. with a cellular PVC cement approved by the PVC Cellular product manufacturer, to prevent joint separation.
  2. The glue joint should be secured with a fastener and/or fastened one each side of the joint to allow adequate bonding time.
  3. Surfaces to be glued should be smooth, clean and in complete contact with each other.
  4. To bond Cellular PVC Trim products to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.
- C. Sealants:
1. Use urethane, polyurethane or acrylic based sealants without silicone.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Manufacturer's instructions:
1. Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.
- B. Fastener Locations:
1. Use two (2) fasteners per every framing member for trim board applications.
  2. Use additional fasteners for trim boards 8" and wider.
  3. Fasteners must be installed no more than 2" from the end of each board.
- C. Thermal Expansion and Contraction:
1. Cellular PVC products expand and contract with changes in temperature.
  2. Properly fastening Cellular PVC material along its entire length will minimize expansion and contraction.
  3. When properly fastened, allow for 1/8" per 18 foot of cellular PVC product to expand and contract.
  4. Joints between pieces of Cellular PVC should be glued to eliminate joint separation. When gaps are glued on a long run, allow expansion and contraction at ends of the run.
- D. Finishes:
1. Install Cellular PVC products with grained surface exposed.
  2. Countersunk nail holes must be filled with a prefabricated plug, polyurethane or acrylic based caulk. Plug or caulk color to match trim board color.

### 3.02 CLEANING

- A. Clean simulated wood trim with mild detergent and water.
- B. Products with pumice, such as Soft Scrub, may be applied with a nylon brush.

- C. For more stubborn stains use a mild household cleaner and degreaser like Clorox Cleanup, Clorox Outdoors, Denatured Alcohol. Bleach, Mr. Clean Magic Eraser or Corte Clean with nylon brush. Always test a small area prior to widespread use.

**3.03 PROTECTION**

- A. Protect installed products until completion of the project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION 066000**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes cold-applied, emulsified asphalt dampproofing applied to the following surfaces:
  - 1. Exterior, CMU wall construction and above grade surfaces of concrete foundation walls.

## 1.03 SUBMITTALS

- A. Submit pursuant to Section 013300 – Submittal Procedures
- B. Submit pursuant to Section 016100 – Product Requirements
- C. Product Data: For each type of product indicated. Include substrate preparation, technical data, and recommendations for method of application, primer, number of coats, and coverage or thickness.
- D. Material Certificates: For each product, signed by manufacturers.

## 1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

## 1.05 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cold-Applied, Emulsified-Asphalt Dampproofing:
    - a. Henry Company.
    - b. Karnak Corporation.
    - c. Koppers, Inc.
    - d. W. R. Meadows, Inc.
    - e. BASF, Master Builders Solutions
    - f. Tamms Industries.

- g. Architect approved equivalent.

## 2.02 BITUMINOUS DAMPPROOFING

- A. Odor Elimination: For interior and concealed-in-wall uses, provide dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.
- B. Cold-Applied, Emulsified-Asphalt Dampproofing:
  - 1. Trowel Coats: ASTM D 1227, Type II, Class 1.
  - 2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
  - 3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

## 2.03 MISCELLANEOUS MATERIALS

- A. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
  - 1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

### 3.03 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
  - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
  - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
- B. Apply dampproofing to footings and foundation walls of elevator pit as shown on Drawing.
  - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing.
  - 2. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.

## 3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m), or one trowel coat at not less than 4 gal./100 sq. ft. (1.6 L/sq. m).

## 3.05 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

**END OF SECTION 071113**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes but not limited to the following:
  - 1. Insulation under slabs-on-grade.
  - 2. Rigid perimeter foundation wall insulation.
  - 3. Board-type cavity wall insulation.
  - 4. Watertight preformed joint filler.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 042200 - Concrete Unit Masonry for board insulation installed in cavity walls. Insulation within the CMU is specified in Section 072127.
  - 2. Section 072116 - Blanket Insulation
  - 3. Section 072129 - Sprayed Insulation
  - 4. Section 075323.13 – Ethylene-Propylene-Diene-Monomer (EPDM) Roofing – Fleeceback
  - 5. Division 22 - Plumbing for pipe insulation
  - 6. Division 23 - HVAC for duct, pipe and equipment insulation

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials".
- C. ASTM E119 "Standard Test Methods for Fire Tests of Building Construction and Materials".
- D. ASTM E136 "Standard Test Method for Behavior of Materials in A Vertical Tube Furnace At 750 degrees C."

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including r-values (aged values for plastic foam insulation), fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.

## 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this Section.
- B. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities

having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristic: ASTM E84.
  2. Fire resistance Ratings: ASTM E119.
- C. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- D. Allowable Thickness Variations: Manufacturer's standard units that vary slightly from the thickness indicated may be acceptable, SUBJECT TO THE APPROVAL OF THE ARCHITECT.
- E. Thermal Resistance: The thicknesses shown are for the thermal resistance (R-Value in accordance with ASTM C177 or ASTM C518) specified for each material. The R-Values specified are minimum acceptable. Provide adjusted thicknesses as directed for the use of material having a different thermal resistance.
- F. Certification: Affidavit by the polystyrene thermal manufacturer, certifying that the insulation was manufactured with CFC-free blowing agents.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Protect plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
  3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide insulation products of one of the following unless otherwise noted:
1. Dow Building Solutions: The Dow Chemical Company
  2. Kingspan Insulation LLC
  3. Owens Corning Foam Insulation, LLC.

#### 2.02 INSULATING MATERIALS

- A. Extruded Polystyrene Board and Polyisocyanurate Insulation:
1. Provide thickness to meet R-value shown on the drawings.
  2. Use Foil Faced Insulation: Thermax or Architect approved equal where shown on Drawings.
  3. Use extruded polystyrene where shown in contact with soil or in exterior wall construction. Insulation shall have a compressive strength of 25 PSI and R-Value of R-5 per inch of thickness.
  4. Use scored extruded polystyrene thickness where shown in masonry cavity walls. Insulation shall have a compressive strength of 25 PSI and R-Value of R-5 per inch of thickness.

- a. Joint tape as recommended by insulation manufacturer.

### 2.03 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding insulation, anchors, or substrates.
- B. Fastening Components
  - 1. Nails or Staples: Steel wire; galvanized, type and size to suit application.
  - 2. Tape: type and size to suit application.
  - 3. Spindle Fasteners: Galvanized wire spindle on flat metal base; self-adhering backing.
- C. Watertight Preformed Joint Filler
  - 1. EMSEAL Joint Systems, Ltd., 25 Bridle Lane, Westborough, MA 01581, Phone 800-526-8365
    - a. DSM System watertight preformed joint filler.
    - b. Size: As shown on contract drawings

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify adjacent materials are dry and ready to receive insulation.
- B. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install insulation in accordance with manufacturer's published instructions.
- B. Butt insulation tight. Leave no gaps or voids.
- C. No voids in the insulation will be permitted.
  - 1. Insulation shall be slit or neatly placed around conduits, pipes, boxes or any other pieces in walls, cavities or below slab grades.
  - 2. Insulation shall not be compressed when placed.
  - 3. Tape all insulation joints in cavity wall insulation.
- D. Any holes, voids or spaces between heated and unheated spaces shall be sealed with foamed in place insulation.
  - 1. Voids are not acceptable.
- E. Joints between dissimilar exterior materials shall be filled with insulation.
  - 1. Compatible foamed in place insulation shall be used where insulation cannot be installed.
  - 2. Sealant and backer rod are required regardless of insulation or foamed in place insulation.
- F. Provide Rigid Extruded Polystyrene Insulation at all new exterior foundation walls and/or grade beams. Extend insulation vertically down face of foundation wall or grade beam. See Contract Drawings for required depths and thickness of foundation insulation. Protect insulation from damage during concrete work and backfilling.
- G. Provide EMSEAL DSM System pre-molded joint filler at top of 3" foundation insulation at heated slabs and at other locations as shown on Contract Drawings. Install DSM System in accordance with manufacturer's instructions.



**3.03 WASTE MANAGEMENT**

- A. Plan and coordinate insulation work to minimize generation of off-cuts and waste. Sequence work to maximize use of insulation off-cuts and waste.

**3.04 PROTECTION**

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION 072113**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes but not limited to the following:
  - 1. Building insulation in batt or blanket form.
  - 2. Sound attenuating fire batt insulation.
  - 3. Eave vent baffles
  - 4. Sill sealer
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 054000 - Cold Formed Metal Framing for thermal insulation installed as part of metal-framed wall assemblies.
  - 2. Section 072113 - Board Insulation
  - 3. Section 075323 - Fully Adhered EPDM Roofing System for roof insulation specified as part of the roofing construction.
  - 4. Section 079200 - Sealants
  - 5. Section 092116 - Gypsum Board Assemblies for thermal insulation and sound attenuation insulation installed as part of metal-framed wall and partition assemblies.
  - 6. Division 22 - Plumbing for pipe insulation.
  - 7. Division 23 - HVAC for duct, pipe, and equipment insulation.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM C553 "Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications".
- C. ASTM C612 "Standard Specification for Mineral Fiber Block and Board Thermal Insulation".
- D. ASTM C665 "Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing".
- E. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials".
- F. ASTM E119 "Standard Test Methods for Fire Tests of Building Construction and Materials".
- G. ASTM E136 "Standard Test Method for Behavior of Materials In A Vertical Tube Furnace At 750 degrees C."

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Submit product data for each type of insulation, sill sealer, and eave bent baffle if of a pre-manufactured style.

- D. Submit shop drawings for any custom fabricated eave vent baffle.
- E. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including R-values, fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.

#### 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this Section.
- B. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
  - 1. Surface Burning Characteristic: ASTM E84.
  - 2. Fire resistance Ratings: ASTM E119.
- C. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- D. Allowable Thickness Variations: Manufacturer's standard units that vary slightly from the thickness indicated may be acceptable, SUBJECT TO THE APPROVAL OF THE ARCHITECT.
- E. Thermal Resistance: The thicknesses shown are for the thermal resistance (R-Value in accordance with ASTM C177 or ASTM C518) specified for each material. The R-Values specified are minimum acceptable. Provide adjusted thicknesses as directed for the use of material having a different thermal resistance.
- F. Certification: Affidavit by the polystyrene thermal manufacturer, certifying that the blanket insulation was manufactured with CFC-free blowing agents.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

### PART 2 PRODUCTS

#### 2.01 INSULATING MATERIALS - GENERAL

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

#### 2.02 FORMALDEHYDE-FREE BATT INSULATION

- A. Manufacturers:
  - 1. Johns-Manville International Inc.
  - 2. Knauf Insulation

3. Owens Corning Eco Touch
- B. Glass Fiber Insulation Batts:
1. Description: flexible, lightweight, thermal, formaldehyde-free insulation made of long, resilient glass fibers bonded with anon-toxic acrylic thermosetting resin binder.
  2. Unfaced, rated non-combustible pursuant to ASTM E84, E119 and E136.
  3. Thermal resistance (R-value) as shown on drawings. R-19 in 6" walls
  4. Width of batts shall completely fill space between framing members. Where framing member spacing exceeds available batt width, provide multiple batts to completely fill space between framing members.
    - a. No voids will be tolerated.

## 2.03 SOUND ATTENUATION FIRE BATT INSULATION (MINERAL WOOL)

- A. Manufacturers:
1. Johns Manville
    - a. Mineral Wool Sound Attenuation Fire Batts (SAFB)
  2. Owens Corning, Thermafiber
    - a. Thermafiber® SAFB™
  3. Rockwool
    - a. AFB evo™
- B. Type: Sound Attenuation Fire Blanket (SAFB)
1. R-Value: 3.7 per inch
  2. Facing: Unfaced only
  3. Density: 4.0pcf (nominal) for 1" thick material
  4. Density: 2.5pcf (nominal) for thickness greater than 1".
  5. Surface Burning Characteristics: Unfaced-Flame spread 0 and Smoke Developed 0
  6. Minimum Recycle content: 70% (pre-consumer)
  7. Formaldehyde-Free product
- C. 3" thickness in 3-5/8" cavities and 6" thickness in 6" or larger cavities (see drawings for wall thickness) Sound Attenuation Fire Batts (SAFB), 16" or 24" wide.
- D. Ceiling: 3" thick x 24" wide Sound Attenuation Fire Batts.
- E. Used in both rated and non-rated interior walls and ceilings wherever sound attenuation is shown on the contract drawings.

## 2.04 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding insulation, anchors, or substrates.
- B. Adhesively Attached Pin Anchors: Perforated plate, 2-inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:
1. Plate: Zinc-plated steel, 0.106-inch thick.
  2. Pin: Copper-coated low carbon steel, fully annealed, 0.106-inches in diameter, length to suit depth of insulation indicated and, with washer in place to hold insulation tightly to substrate behind insulation.
  3. Self-Locking washer: Mild steel, 0.016-inch thick, sizes as required to hold insulation securely.
    - a. Where spindles will be exposed to human contact after installation, project ends with capped self-locking washers.

## C. SILL SEALER

1. Install high-density Polyethylene foam sill sealer at all exterior stud walls under all bottom tracks (not just at top of foundation wall).

## D. FASTENING COMPONENTS

1. Nails or Staples: Steel wire; galvanized, type and size to suit application.
2. Tape: type and size to suit application.
3. Spindle Fasteners: Galvanized wire spindle on flat metal base; self-adhering backing.

## E. WIRE-UP INSTALLATION

1. Wire Mesh: galvanized steel, hexagonal wire mesh.
  - a. 16 Gauge Wire at 24" o.c. min.

## F. INSULATION EAVE VENT BAFFLES 16" or 24" TRUSS SPACING

1. Manufacturers: DCI Products, 415 South Penn St., Clifton Heights, PA, 19018; Phone: 800-622-4455 or Architect Approved Equivalent.

## G. Material: 1/8" minimum thickness corrugated plastic compatible with spray foam insulation.

1. Must provide 2" minimum airflow between trusses.

## H. INSULATION EAVE VENT BAFFLES - TRUSS SPACING GREATER THAN 24" O.C.

1. Shop formed galvanized steel 2" deep pans with two stiffening ribs in bottom of pan.
2. Provide two inch wide flange on top edge of each side of pan to secure vent pan to bottom of roof decking.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify adjacent materials are dry and ready to receive insulation.
- B. Verify mechanical and electrical services within walls have been installed and inspected.
- C. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

## 3.02 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removal of projections that might puncture vapor retarders.
- B. Verify that adjacent materials are dry and ready to receive the insulation.

## 3.03 INSTALLATION

- A. Install insulation in accordance with manufacturer's published instructions.
- B. Butt insulation tight.
- C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation. Leave no gaps or voids.
- D. Fasten in place at maximum 6 in. on center, tape in place, or retain in place with spindle fasteners or retain in place with mesh secured to framing members as required by manufacturer's published instructions. Tape seal butt ends and lapped side flanges. Tape seal

tears or cuts in membrane with material compatible with membrane, on an insulation that bears a facing.

- E. All spaces around windows, doors and other penetrations shall be filled or foamed with insulation, with no voids.
- F. In exterior stud walls and insulated interior stud walls, all cavities within studs placed adjacent to each other shall be filled with insulation as stud assemblies are built. Likewise, all cavities in headers shall be filled with insulation.
- G. No voids in the insulation will be permitted.
  - 1. Insulation shall be slit or placed around conduits, pipes, boxes or any other pieces in walls or roof.
  - 2. Insulation shall not be compressed when placed, except where indicated to be stuffed.
- H. Any holes, voids or spaces between heated and unheated spaces shall be sealed with foamed in place insulation.
  - 1. Voids are not acceptable.
- I. Joints between dissimilar exterior materials shall be filled with batt insulation.
  - 1. Foamed in place insulation shall be used where batt insulation cannot be installed.
  - 2. Sealant and backer rod are required regardless of insulation or foamed in place insulation.
- J. Do not place insulation over or within 3-inches of recessed lighting fixtures, unless fixtures are rated for insulation contact.
- K. Where two layers of insulation are indicated, run second layer perpendicular to first layer.
- L. Apply sound attenuating fire batts; friction-fit in all partitions indicated by the wall type and/or keynote on the floor plans. Use metal clips or wire as required to ensure that the blankets remain in place in the wall assembly. Install the insulation consistently on one side of the partition filling the cavity to the full height of the wall. Leave no voids.
- M. Install sound attenuating fire batts above ceilings where indicated on the Contract Drawings.
- N. Install eve vent baffles between roof trusses at all vented eaves. Secure baffles to top chord of truss or bottom of roof deck with pan head screws 8" o.c.

### 3.04 WASTE MANAGEMENT

- A. Plan and coordinate insulation work to minimize generation of off-cuts and waste. Sequence work to maximize use of insulation cut-offs and waste,

### 3.05 PROTECTION

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation

**END OF SECTION 072116**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Building wrap.
  - 2. Flexible flashing.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

## PART 2 - PRODUCTS

## 2.01 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek Drainwrap.
    - b. Or approved equal.
  - 2. Water-Vapor Permeance: Not less than 50 perms per ASTM E 96/E 96M, Desiccant Method B.
  - 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch w.g (0.02 L/s x sq. m at 75 Pa) when tested according to ASTM E 2178.
  - 4. Allowable UV Exposure Time: Not less than three months.
- B. Building-Wrap Tape: 3 inch wide, Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

## 2.02 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: use flashing material as recommended by the approved Weather Barrier manufacturer for the various conditions encountered on the project. Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 64 mil.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
    - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.

- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Fasteners: Provide corrosion resistant fasteners with plastic caps in types and sizes recommended by the approved Weather Barrier manufacturer for the type of construction (metal, wood or masonry) being utilized on the project.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories

### 3.02 WATER-RESISTIVE BARRIER INSTALLATION

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- C. Apply wrap with grooved surface pattern in vertical direction.
- D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with grooved surface pattern in vertical position. Maintain weather barrier plumb and level.
- E. Extend bottom roll edge over sill plate 2" to 3". Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of weep screed. Seal weather barrier with sealant or tape to weep screed. Ensure weeps are not blocked.
- F. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.
- G. Window and Door Openings: Extend weather barrier completely over openings.
- H. Weather Barrier Attachment:
  - 1. Frame Construction:
    - a. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
  - 2. Masonry Construction:
    - a. Attach weather barrier to masonry. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site
- I. Seaming:
  - 1. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
  - 2. Seal any tears or cuts as recommended by weather barrier manufacturer.
- J. Opening Preparation:
  - 1. Cut weather barrier in an "I" cut pattern. A modified "I" cut is also acceptable.



- a. Cut weather barrier horizontally along the bottom and top of the window opening.
  - b. From the top center of the window opening, cut weather barrier vertically down to the sill.
  - c. Fold side and bottom weather barrier flaps into window opening and fasten.
2. Cut a head flap at 45-degree angle in the weather barrier membrane at window head to expose 8 inches of sheathing. Temporarily secure weather barrier membrane flap away from sheathing with tape.
- K. Flashing: (DuPont or approved equal)
1. Cut 9-inch wide FlexWrap™ or FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer to sheathing as recommended by manufacturer.
  2. Cover horizontal sill by aligning FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
  3. Fan FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for FlexWrap™ NF.
  4. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
  5. Install window according to manufacturer's instructions.
  6. Apply 4-inch wide strips of StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.
  7. Apply 4-inch wide strip of StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.
  8. Position weather barrier head flap across head flashing. Adhere using 4-inch wide StraightFlash™ over the 45-degree seams.
  9. Tape head flap in accordance with manufacturer recommendations.
  10. On interior, install backer rod in joint between frames of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.
- L. Thru-Wall Flashing Installation:
1. Apply primer per manufacturer's written instructions.
  2. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.
  3. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.
  4. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.
  5. Roll flashing into place. Ensure continuous and direct contact with substrate.
  6. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.
  7. Trim exterior edge of membrane 1-inch and secure metal drip edge per manufacturer's written instructions.
- M. Thru-Wall Flashing / Weather Barrier Interface at Base of Wall:
1. Overlap thru-wall flashing with weather barrier by 6-inches.
  2. Mechanically fasten bottom of weather barrier through top of thru-wall flashing.
  3. Seal vertical and horizontal seams with tape or sealing membrane.
- N. Thru-Wall Flashing / Weather Barrier Interface at Shelf Angle:
1. Seal weather barrier to bottom of shelf angle with sealing membrane.
  2. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.
  3. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.
- O. Thru-Wall Flashing / Weather Barrier Interface at Window Head:

1. Cut flap in weather barrier at window head.
  2. Prime exposed sheathing.
  3. Install lintel as required. Verify end dams extend 4 inches minimum beyond opening.
  4. Install end dams bedded in sealant.
  5. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.
  6. Apply sealant along thru-wall flashing edges.
  7. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.
  8. Tape diagonal cuts of weather barrier.
  9. Secure weather barrier flap with fasteners.
- P. Building Paper: Apply horizontally with a 2-inch (50-mm) overlap and a 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails.
- Q. Building Wrap: Comply with manufacturer's written instructions.
1. Seal seams, edges, fasteners, and penetrations with tape.
  2. Extend into jambs of openings and seal corners with tape.

**END OF SECTION 072500**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This section includes, but is not limited to, the following:
  - 1. Infiltration Barrier (Weather Resistive Barrier).
  - 2. Window, Door, Louver & Transition Flashing
  - 3. Air Barriers.
  - 4. Vapor Retarders.
  - 5. Sill Sealer.
  - 6. Foam Closure Strip at Metal Roof Decking.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 033000 - Cast-in-Place Concrete
  - 2. Section 053100 - Steel Decking
  - 3. Section 054000 - Cold Formed Metal Framing.
  - 4. Section 061643 - Gypsum Sheathing
  - 5. Section 075323.13 – Ethylene-Propylene-Diene-Monomer (EPDM) Roofing – Fleeceback
  - 6. Section 076200 - Sheet Metal Flashing and Trim
  - 7. Section 079200 - Sealants

## 1.03 STANDARDS AND REFERENCES

- A. ASTM International
  - 1. ASTM D 882; Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
  - 2. ASTM D 1117; Standard Guide for Evaluating Non-woven Fabrics.
  - 3. ASTM E 84; Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 4. ASTM E 96; Standard Test Method for Water Vapor Transmission of Materials.
  - 5. ASTM E 1677; Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.
  - 6. ASTM E 2178; Standard Test Method for Air Permeance of Building Materials.
  - 7. ASTM E 2357; Standard Test Method of Determining Air Leakage of Air Barrier Assemblies.
- B. AATCC - American Association of Textile Chemists & Colorists
  - 1. Test Method TM127 Water Resistance: Hydrostatic Pressure Test
- C. TAPPI
  - 1. Test Method T-460; Air Resistance of Paper (Gurley Hill Method)

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations.

- D. Manufacturer's field service reports for infiltration barrier: Provide pre-installation conference and site reports from authorized field service representative, indicating observation of infiltration barrier assembly installation.
- E. Infiltration Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion:
  - 1. Warranty Period: 10-year limited product and labor warranty.

#### 1.05 PRE-INSTALLATION MEETING

- A. Hold a pre-installation conference, two weeks prior to start of infiltration barrier installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and infiltration barrier manufacturer's designated representative.
- B. Review all related project requirements and submittals, status of substrate work and Preparation, areas of potential conflict and interference, availability of infiltration barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordination of methods, procedures and sequencing requirements for full and proper installation, integration and protection.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials as recommended by manufacturer.

### PART 2 PRODUCT

#### 2.01 VAPOR RETARDER

- A. Wall and Roof
  - 1. Vapor Retarder shall be six (6) mil. polyethylene for wall and warm side of attic/roof construction.
- B. Under slab on grade
  - 1. See Section 033000 - Cast-in-Place Concrete

#### 2.02 INFILTRATION BARRIER

- A. Infiltration barrier DuPont™ Tyvek® DrainWrap™ or an Architect Approved Equivalent shall be installed over all exterior wall sheathing.
  - 1. Air Penetration: .004 cfm/ft<sup>2</sup> at 75 Pa maximum when tested in accordance with ASTM E2178. Type 1 when tested in accordance with ASTM E-1677.
  - 2. Water Vapor Transmission: 36 perms, when tested in accordance with ASTM E96, Method A
  - 3. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
  - 4. Basis Weight: 2.1-oz/yd<sup>2</sup> min., when tested in accordance with TAPPI Test Method T-410.
  - 5. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 25.
  - 6. Infiltration Barrier to be made of spunbonded polyolefin, non-woven, non-perforated infiltration barrier (weather barrier).
    - a. Infiltration barrier to be covered within four (4) months of installation.

- B. Tape: 3" wide pressure sensitive tape of type recommended by manufacturer for sealing joints and penetrations in infiltration barrier.
- C. Fasteners: DuPont Tyvek Wrap Cap Screws, as distributed by DuPont: 1-5/8" rust resistant screw with 2" diameter plastic cap or manufacturer approved equivalent.

#### 2.03 WINDOW, DOOR, LOUVER AND TRANSITION FLASHING (WDLT FLASHING)

- A. Self adhering membrane consisting of an SBS rubberized asphalt compound integrally laminated to an engineered film.
  - 1. Thickness: 35 mils minimum
  - 2. Primer: As recommended by manufacturer.
  - 3. Manufacturer: Henry Company Blueskin WB or Architect approved equivalent.
  - 4. Termination Bar: 1/8" x 1", 304 stainless steel, continuous, fastened at 16" o.c.

#### 2.04 AUXILIARY SEALING MATERIALS

- A. SILL SEALER
  - 1. Install high-density Polyethylene foam sill sealer under bottom track at all exterior stud walls. Sealer to be full width of track.
- B. FOAM CLOSURE STRIPS
  - 1. Provide top and bottom void strip foam closures by Metal Deck.com or Architect approved equivalent.
  - 2. Foam Closure Strips to be manufactured to match the profile of the roof deck.
  - 3. Install in top and bottom flutes of all roof decking at perimeter envelope insulation as shown on Contract Drawings.

### PART 3 EXECUTION

#### 3.01 VAPOR TIGHTNESS

- A. No tears or gaps in the vapor retarder and infiltration barrier will be allowed. Repair any tears or punctures in barriers immediately BEFORE CONCEALMENT by other work. Cover tape or add another layer of vapor/infiltration barrier.
- B. Vapor retarders are to be installed over all exterior batt insulation, uninterrupted from slab to roof deck or as detailed on Contract Drawings.
  - 1. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
  - 2. Overlap joints a minimum of 24".
  - 3. Overlapped joints shall be completely covered with adhesives or tape per vapor barrier/retarder manufacturer's printed directions. Locate all joints over framing members or other solid substrates.
- C. The joint between the exterior wall Gypsum Wall Board and the roof deck shall be sealed against air infiltration. The exterior wall Gypsum Wall Board shall overlay the bottom plate. Use foam closure strips specified above in both top and bottom flutes behind the exterior wall gypsum sheathing.

#### 3.02 AIR TIGHTNESS

- A. Infiltration Barrier

1. All joints in the infiltration barrier will be lapped a minimum of six (6) inches and sealed with an approved construction tape. Overlap infiltration barrier at exterior corners a minimum of 12 inches.
  2. The infiltration barrier shall be neatly folded into each building opening in a manner to eliminate any gaps in the continuous airtight surface.
  3. Any terminating edges of the infiltration barrier, such as at the top or bottom of the wall shall be sealed with caulk.
  4. All penetrations shall be fully sealed per manufacturer's recommendations.
  5. Seal any tears or cuts as recommended by infiltration barrier manufacturer.
  6. Notify manufacturer's designated representative to obtain required periodic observations of infiltration barrier installation.
- B. It is intended that the building be as airtight as practical.
1. It is incumbent upon the contractor to notify the Architect of any conflict or problem, so the Architect may make revisions or modifications to the work.
  2. Notify Architect and allow 48 hours (minimum) for inspection of the insulation and vapor barrier prior to covering or sealing of the work.

### 3.03 WINDOW, DOOR, LOUVER AND TRANSITION FLASHING (WDLT FLASHING)

- A. Surface Preparation
1. All surfaces must be clean of oil, dust and excess mortar. Strike masonry joints flush.
  2. Prime all surfaces to receive flashing in accordance with manufacturer's recommendations.
- B. Installation
1. Lap flashing a minimum of 2" on both side and end laps. Orient laps shingle fashion to shed water. Seal joints in accordance with manufacturer's recommendations.
  2. Membrane applied to the underside of the substrate (i.e. ceilings) requires mechanical fastening with termination bars.
  3. Install termination bar where shown on the contract documents or required to insure permanent adhesion to substrate.
  4. Where spanning a change in substrates, beam, column, brace, etc., flashing shall extend onto each surface a minimum of 4" on each side of the discontinuity.
- C. Locations
1. Install at all window, door, louver, duct, pipe, conduit penetrations of the exterior gypsum/wood sheathing or exterior CMU back-up masonry.
  2. Install at all inside and outside corners of exterior gypsum/wood sheathing.
  3. Transition flashing shall span any discontinuity between exterior wall back-up materials. These can be vertical, horizontal and/or diagonal. Examples are:
    - a. Gypsum/wood sheathing terminates at start of exterior CMU back-up with both materials in the same plane.
    - b. Gypsum/wood sheathing overlaps exterior CMU back-up and terminates.
    - c. Exterior CMU back-up wall is not continuous due to a steel column, beam and/or brace.
    - d. Exterior gypsum/wood sheathing is not continuous due to a steel column, beam and/or brace.
  4. At all other locations shown on Contract Drawings.

### 3.04 PROTECTION

- A. General: Protect installed insulation, infiltration barriers, WDLT flashings and vapor barriers from damage due to harmful weather exposures, physical abuse, and other causes. Provide

temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

- B. Protect WDLT flashings from sunlight as quickly as possible. Exposure to sunlight shall be limited to six weeks or as recommended by manufacturer in writing.

**END OF SECTION 072713**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Asphalt shingles.
  - 2. Underlayment.
  - 3. Roof Deck Protection.
  - 4. Ridge Vents.
  - 5. Accessories.
  - 6. Metal Flashing and Trim.

## 1.03 DEFINITION

- A. Roofing Terminology: See ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of asphalt shingle ridge vent and exposed valley lining indicated.
  - 1. Include similar Samples of trim and accessories involving color selection.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.
- C. Research/Evaluation Reports: For each type of asphalt shingle required, from the ICC.
- D. Warranties: Sample of special warranties.

## 1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

## 1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Asphalt Shingles: 100 sq. ft. (9.3 sq. m) of each type, in unbroken bundles.

## 1.08 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.



- B. Source Limitations: Obtain ridge and hip cap shingles ridge vents felt or composite underlayment and self-adhering sheet underlayment from single source from single manufacturer.
- C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
  - 1. Exterior Fire-Test Exposure: Class A; ASTM E108 or UL 790, for application and roof slopes indicated.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
  - 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

#### 1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

#### 1.11 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Manufacturing defects.
    - b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
  - 2. Material Warranty Period: 40 years from date of Substantial Completion.
  - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 130 mph (58 m/s).
  - 4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor 15 years from date of Substantial Completion.
  - 5. Workmanship Warranty Period: 12 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.01 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing. UI 790 Class A rated with UI 997 Wind resistance Label; ASTM D 7158, Class H (150 mph); ASTM D3161/D3161M, Class F (150 mph), Type 1; ASTM D 3018, Type 1; AAC438 compliant. Shingle packaging shall bear the label: ASTM D3161/D3161M, Class F (150 mph).

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. GAF Materials Corporation. "Timberline HD Lifetime High definition Shingles"
  - b. CertainTeed Corporation "Landmark PRO"
  - c. Or approved equal.
2. Butt Edge: Crenelated cut.
3. Strip Size: Manufacturer's standard.
4. Algae Resistance: Granules treated to resist algae discoloration.
5. Color and Blends: As selected by Architect from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

## 2.02 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (30 pound), asphalt-saturated organic felts, non-perforated.
- B. Premium, water repellant, breather type non-asphaltic roof deck protection: UV stabilized polypropylene construction. Meets or exceeds ASTM D226/D226MASTM D226 and D4869. GAF "Deck-Armor" TM, "DiamondDeck" or similar as required for approved manufacturer's warranty.

## 2.03 LEAK BARRIER

- A. Self-Adhering Sheet Underlayment, Granular Surfaced: ASTM D1970/D1970M, minimum of 55-mil thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. GAF Materials Corporation- WeatherWatch.
    - b. CertainTeed Corporation.
    - c. Carlisle Coatings & Waterproofing, Inc.
- B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D1970/D1970M, minimum of 40-mil thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Grace, W. R. & Co.: "Ice and Water Shield".
    - b. GAF Materials Corporation: "StormGuard".
    - c. Carlisle Coatings & Waterproofing, Inc.

## 2.04 RIDGE VENTS

- A. Rigid plastic ridge ventilator designed to allow the passage of hot air from attics while prohibiting snow infiltration. For use in conjunction with eave/ soffit intake ventilation products. Units available in 9 inch and 11.5 inch widths providing 18.0 sq. inches Net Free Ventilation Area per lineal foot. Cobra® Snow Country Advanced™ Ridge Vent (includes 3 inch galvanized ring shank nails), by GAF® or approved equal.
  1. Hip Roof Ridge Vent: Cobra Hip Vent units, 4 foot long x 11.5 inches wide, providing 9.0 sq. inches per lineal foot.
- B. Flash-Vent: Provide Roof-2-Wall ridge ventilation as manufactured by Cor-A-Vent. where indicated on the drawings. Provide matching end caps. Install as recommended by the manufacturer.

## 2.05 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586/D4586M, Type II, asbestos free.
- B. Roofing Nails: ASTM F1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch diameter, smooth shank, sharp-pointed, with a minimum 3/8-inch diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through plywood sheathing.
  - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.
- D. Algae-Mold-Moss Termination Roofing Strip Material: Copper-Cat® Algae Terminator manufactured from double sided 99.9% pure grade copper. Install on each side of ridge shingles using copper nails and overlaps and sealant as per manufacturer's instructions. Fifty-year Limited Warranty. Manufacturer: Copper-Cat; 1748 Traditional Drive, Suite B, Walled Lake, ME 48390; www.coppercat.com; tel.: 866.526.2228.
- E. Metal Accessory Paint: GAF Shingle-Match™ Accessory Paint to blend items such as Plumbing Vent Pipes, Exhaust fans, Flashings, Roof ventilators, etc. to match more closely to the installed Asphalt Shingle Roof color. Available in 12 oz. spray cans. Color(s) shall be: As selected by the Architect from the manufacturers full color offering.

## 2.06 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 - SHEET METAL FLASHING AND TRIM.
  - 1. Sheet Metal: 0.032-inch aluminum sheet, complying with ASTM B209.
  - 2. Sheet Metal: 24 gauge hot-dip galvanized steel sheet, complying with ASTM A653/A653M, G90/Z275.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in the SMACNA "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
  - 1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
  - 2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 5 inches over the underlying asphalt shingle and up the vertical surface.
  - 3. Cricket and Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of chimney and 6 inches above the roof plane.
  - 4. Open-Valley Flashings: Fabricate in lengths not exceeding 10 feet with 1-inch high, inverted-V profile at center of valley and equal flange widths of 12 inches.
  - 5. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
- C. Vent Pipe Flashings: ASTM B370, 16 oz. / sq. ft., Provide 3" deep shop fabricated copper cap sized to slip over and turn down into pipe, solder to flashing sleeve with skirt at slope of roof, and extending at least 6 inches (152 mm) from pipe onto roof.
- D. Exterior acrylic rust resistant aerosol roof accessory paint. Each can is available in a wide variety of colors to compliment the roof. Shingle-Match™ Roof Accessory Paint by GAF® or approved equal.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt or Deck-Armour Underlayment (as required by applicable Warranty): Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches or as recommended by the manufacturer. Fasten with roofing nails.
  - 1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt or underlayment over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt or underlayment not less than 6 inches over self-adhering sheet underlayment.
  - 2. Install fasteners at no more than 18 inch o.c.
- C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
  - 1. Eaves: Extend from edges of eaves 36 inches beyond interior face of exterior wall.
  - 2. Rakes: Extend from edges of rake 36 inches beyond interior face of exterior wall.
  - 3. Valleys: Extend from lowest to highest point 18 inches on each side.
  - 4. Hips: Extend 18 inches on each side.
  - 5. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
  - 6. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 6 inches.
  - 7. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches.
  - 8. Roof Slope Transitions: Extend 18 inches on each roof slope.
- D. Concealed, Valley Lining: Comply with NRCA's recommendations. Install a 36-inch wide felt underlayment centered in valley. Fasten to roof deck with roofing nails.
  - 1. Lap roof-deck felt underlayment over valley felt underlayment at least 6 inches.
  - 2. Install a 36-inch wide strip of granular-surfaced valley lining centered in valley, with granular-surface face up. Lap ends of strips at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck with roofing nails.

## 3.03 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 - SHEET METAL FLASHING AND TRIM.
  - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- F. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

## 3.04 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual". In High Wind locations, installations shall comply with FEMA High Wind roof application criteria.
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least 7 inches wide with self-sealing strip face up at roof edge as recommended by the manufacturer. Provide manufacturer's required starter, hip and ridge accessory shingles required to meet specified warranty requirements.
  - 1. Extend asphalt shingles 3/4 inch over fascia at eaves and rakes.
  - 2. Cement shingles to underlayment and each other in a 4 inch width of asphalt plastic roof cement.
  - 3. Install starter strip along rake edge.
  - 4. Nail approximately 1-1/2 - 3 inches above the butt edge of the shingles.
  - 5. Rake starter course should overlap eave edge starter strip at least 3 inch.
- C. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses or as recommended by the manufacturer to achieve random roof texture.
- D. Placement of nails varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.
- E. Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions and FEMA requirements.
  - 1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
  - 2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
  - 3. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

4. Nails must be driven flush with the shingle surface. Do not overdrive or under drive the nails.
- F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing. Cut continuous vent slots through the sheathing, stopping 6 inches from each end of the ridge.
1. On roofs with ridge board, make two slots 1-3/4 inches wide, one on each side of the peak (3 1/2 inch overall).
  2. Install ridge vent material along the full length of the ridge, including uncut areas.
  3. Butt ends of ridge vent material and join using roofing cement.
  4. Install eaves vents in sufficient quantity to equal or exceed the ridge vent area.
- G. Ridge and Hip Cap Shingles: Provide manufacturer's required ridge and hip shingles required to meet warranty conditions. Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.
- H. Penetrations
1. All Penetrations are to be flashed according to GAF®, ARMA and NRCA application instructions and construction details.

### 3.05 PROTECTION

- A. Protect installed products from foot traffic until completion of the project.
- B. Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.

### END OF SECTION 073113

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Continuous insulation (CI) composite framing support (CFS) system integrated with brick veneer exterior wall cladding.
  - 1. Substrate: Exterior sheathing over metal stud framing or Concrete masonry units (CMU).

## 1.02 RELATED REQUIREMENTS

- A. Section 042200 - CONCRETE UNIT MASONRY: Concrete masonry unit (CMU) wall substrate
- B. Division 07: Wall cladding system
- C. Section 079200 - JOINT SEALANTS: Perimeter sealant

## 1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- D. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).
- E. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.
- F. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).
- G. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.
- H. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- I. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.
- J. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30 C and 30 C with a Vitreous Silica Dilatometer; 2016.
- K. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.
- L. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2020.
- M. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2018.

- N. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- O. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- Q. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.
- R. AAMA - American Architectural Manufacturers Association ([www.aamanet.org](http://www.aamanet.org))
  - 1. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2005
- S. ASCE American Society of Civil Engineers ([www.asce.org](http://www.asce.org))
  - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures
  - 2. ASCE - Structural Plastics Design Manual
- T. ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers ([www.ashrae.org](http://www.ashrae.org))
  - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings
- U. ASTM International (American Society for Testing and Materials; [www.astm.org](http://www.astm.org))
  - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - 2. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
  - 3. ASTM D570 - Standard Test Method for Water Absorption of Plastics
  - 4. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
  - 5. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
  - 6. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics
  - 7. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
  - 8. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics
  - 9. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
  - 10. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
  - 11. ASTM D4385 - Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products
  - 12. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
  - 13. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
  - 14. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials
  - 15. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
  - 16. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference



- 17. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2009
- 18. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- V. IBC - International Building Code (International Code Council)
- W. IECC - International Energy Conservation Code
- X. NFPA - National Fire Protection Association ([www.nfpa.org](http://www.nfpa.org))
  - 1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012
- Y. Voluntary Product Standard; National Institute of Standards and Technology (NIST)
  - 1. PS 1 - Structural Plywood

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate construction of wall cladding support system over substrate indicated for proper drainage, flashing, trim, back-up support, soffits, and other related Work.

#### 1.05 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for submittal procedures.
- B. Product Data: Submit for each type of product indicated; include construction details, material descriptions, dimensions of individual components and profiles, and accessories as necessary for complete fully functioning and assembled system.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least five years of documented experience.
  - 1. System Review: Manufacturer to provide engineering assessment based on CFS and cladding system design.
- B. Installer: Company specializing in performing work of this section and the following:
  - 1. Install system in strict compliance with manufacturer's installation instructions.
  - 2. Have not less than three years of documented experience.
  - 3. Factory trained and approved by CFS system manufacturer.
- C. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a licensed Structural Engineer experienced in design for this type of Work and licensed in State that Project is located.
- D. Source Limitations: Obtain CI and CFS system from single source and single manufacturer.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original unopened containers and packaging with labels clearly identifying product name and manufacturer.
- B. Deliver components and other manufactured items or accessories without damage or deformation.

- C. Storage: Store materials in clean, dry, and level interior areas or outdoor areas for limited duration in accordance with manufacturer's written instructions.
- D. Protect components and auxiliary accessories during transportation, handling, and installation from moisture, excessive temperatures and other construction operations in accordance with manufacturer's written instructions.
- E. Handle components in strict compliance with manufacturer's written instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface, edge or corner damage.

#### 1.08 SITE CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work in accordance with manufacturer's written installation instructions and warranty requirements.

#### 1.09 WARRANTY

- A. See Section 017800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.
- B. CFS System Warranty: Provide written warranty by manufacturer agreeing to correct defects in manufacturing within a five year period after Date of [Delivery] or [Substantial Completion].

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURER

- A. Advanced Architectural Products (A2P): SMARTci Plus 3-in-1 System  
Address: 959 Industrial Drive, Allegan, Michigan 49010.  
Phone: (269) 355-1818; Fax: (866) 858-5568; Website: [www.smartcisystems.com](http://www.smartcisystems.com)
- B. Other products shall be pre-submitted and approved products that meet materials and performance requirements with specified and validated third party testing.

#### 2.02 DESCRIPTION

- A. Attach CFS system components to open metal stud framing without sheathing, exterior sheathing over metal stud framing, and concrete masonry units (CMU).
- B. Install CI panels and CFS system components vertically on masonry or concrete substrate with shims or horizontally on substrate system as indicated on drawings in compliance with specified requirements.

#### 2.03 PERFORMANCE REQUIREMENTS

- A. Structural: Provide system tested in accordance with ASTM E330/E330M and certified to be without permanent deformation or failure of structural members in accordance with design wind velocities for project geographic location and probability of occurrence based on data from wind velocity maps provided in ASCE 7 and as approved by authorities having jurisdiction (AHJ).
  - 1. Measure performance of assembly using test loads equal to 1-1/2 times design wind loads indicated and with 10 second duration at maximum pressure.
  - 2. CFS System: Structurally engineered to provide in excess of three (3) or four (4) times structural safety factor for lengthwise, longitudinal, and crosswise loading.

3. Measure the performance of the factory formed joints using a minimum of 30 PSF per ASTM E72.
- B. Air Infiltration Test: Maximum of 0.06 cfm/sq ft of wall area in accordance with ASTM E283 or ASTM E2357 at an air pressure differential of 6.27 lbf/sq ft across assembly.
- C. System Thermal Design: Ensure installed CI and CFS system, opening trim, sub-framing, clips and cladding attachment does not have thermal bridging of fasteners or framing that creates a continuous metal path from exterior surface of insulation to exterior face of stud framing or interior face of insulation.
  1. System thermal design shall meet or exceed thermal design requirements in compliance with ASHRAE 90.1, ASHRAE 189.1, IgCC, or IECC energy code.
  2. Thermal Resistance: Wall assembly R Value of as indicated on drawings.
  3. Thermal Performance Test: Provide thermal resistance (R-value) indicated, in compliance with ASTM C1363, corrected to 15 mph outside and still air inside, with installed condition including fastening and joints.
    - a. Provide efficiency of no less than 93 to 98 percent, with a maximum temperature differential of 18 degrees F from interior wall surface to interior wall cavity and node locations with a 70 degrees F exterior to interior wall temperature delta.
    - b. Provide test unit with at least one insulation panel horizontal and vertical joint length and height of test chamber area.
    - c. Provide finite element analysis of three dimensional simulation of described wall assembly sealed by professional engineer in compliance with performance requirements and exceeding it by at least 3 percent.
- D. Temperature: Comply with structural loading requirements within temperature range of minus 55 degrees F to 180 degrees F.
- E. Fire-Test-Response Characteristics: Provide composite framing support system with fire-test results indicated as determined by test standard indicated and applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
  1. Surface Burning Characteristics: In compliance with ASTM E84, for foam insulation, steel fiber reinforced polymer (FRP) and interior surfaces as follows:
    - a. Flame Spread Index (FSI): 25 or less.
    - b. Smoke Developed Index (SDI): 450 or less.

#### 2.04 COMPOSITE FRAMING SUPPORT (CFS) SYSTEM

- A. CFS System: Provide CFS system consisting of polyester and vinyl ester bioresin matrix (FRP) with recycled materials, fire retardant additives and integral continuous metal inserts the length of profile. Reinforce CFS system with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
  1. Depth of GreenGirt: 3 inch high.
  2. On Center Spacing: 16 inch.
  3. Provide continuous non-corrosive steel insert for engagement of fasteners, 16 gage, minimum, with G90 galvanized coating designation in compliance with ASTM A653/A653M.
    - a. Fully engage steel insert with adjacent CFS at ends.
    - b. Anchor sub-girts and other wall cladding support accessories to steel insert set into and part of CFS.
    - c. Provide screw pullout testing that meets or exceeds 210 pounds.
  4. Provide integral 3-point compression seal in CFS sections to ensure insulation panel will not dislodge and to eliminate air and water movement throughout system.
  5. Provide integral anti-siphon grooves on exterior and interior flanges of CFS.
  6. Provide force distribution zones integrally designed into profile of CFS.

7. Provide spline seals for adjacent insulation units into profile of CFS.
8. Surface Burning Characteristics:
  - a. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
  - b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
9. Flammability: Comply with ASTM E84.
10. Self-Extinguishing: Comply with ASTM D635.
11. Profile Visual Requirements: Comply with ASTM D4385.
12. Tensile Stress: Provide engineered lengthwise and crosswise tensile stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D638.
13. Compressive Stress: Provide engineered lengthwise and crosswise compressive stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D695.
14. Flexural Stress: Provide engineered lengthwise and crosswise flexural stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D790.
15. Modulus of Elasticity: Engineered to meet performance loading criteria and specified safety factors.
16. Barcol Hardness: 45, in accordance with ASTM D2583.
17. Water Absorption: Less than 0.46 percent by weight, within 24 hours, in accordance with ASTM D570.
18. Density: Within range of 0.062 to 0.070 lbs/cubic inch, in accordance with ASTM D792.
19. Lengthwise Coefficient of Thermal Expansion:  $7.0 \times 10^{-6}$  inch/inch/degrees F, in accordance with ASTM D696.
20. Notched Izod Impact, Crosswise: 4 ft lbs/inch, in accordance with ASTM D256 within temperature range indicated.

## 2.05 INSULATION

- A. Insulation Panel Edges: Provide factory formed edges on insulation panels that interlock with CFS system components.

## 2.06 COMPOSITE MATERIAL TRIM FOR OPENINGS

- A. Composite Trim ; Provide composite trim at rough openings to properly transition CI system.
  1. Use trim angles and accessories sized to enclose CI system to provide thermally broken transition from opaque wall assemblies.
  2. Use sealant and tapes as required to transition vapor barrier from substrate onto trim.
  3. Trim to provide 90 degree transition of continuous insulated substrate for vapor barrier and exterior flashings.
  4. Trim to be covered by exterior panel construction and flashings.
  5. Tensile Stress: Provide engineered lengthwise and crosswise tensile stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D638.
    - a. Minimum crosswise and longitudinal: 33,000 ksi.
  6. Compressive Stress: Provide engineered lengthwise and crosswise compressive stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D695.
    - a. Minimum: 22,000 psi.
  7. Flexural Stress: Provide engineered lengthwise and crosswise flexural stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D790.
    - a. Minimum: 30,000 psi.

8. Modulus of Elasticity: Engineered to meet performance loading criteria and specified safety factors.
  - a. Minimum: 2,500,000 psi.
9. Surface Burning Characteristics:
  - a. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
  - b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
10. Comply with fire-resistance requirements, as indicated on drawings, and as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
11. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with ASTM D570.
12. Acceptable Products:
  - a. SMARTci Trim
13. Alternative:
  - a. Performance CI system utilizing metal trim to provide spray foam insulation at a depth of 6" extending 32" around openings to reduce thermal transfer at wall transitions.

## 2.07 CONTINUOUS INSULATION SYSTEM ASSEMBLY

- A. Assemble CI with CFS system using manufacturer's standard procedures and processes identical to tested units and as necessary to comply with performance requirements indicated.
  1. Comply with CFS system and dimensional and structural requirements as indicated on drawings.
  2. Erect CFS system in established sequence in accordance with manufacturer's standard installation procedures.
  3. CFS and CI panels shall create an air/water/vapor barrier system compliant with requirements for project.
  4. Provide spray foam sealant on backside of cantilevered fasteners that completely puncture insulation layer.

## 2.08 ACCESSORIES

- A. Provide accessories necessary for complete CFS system including metal closure trim, transition angle, strapping, or tie-in brackets and similar items.
- B. Fasteners: Corrosion-resistant, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as recommended by CFS system manufacturer for project application.
  1. Cladding to CFS System: Use standard self-tapping metal screws.
  2. CFS System to Metal Stud Wall Framing: Use standard self-tapping metal screws.
  3. CFS System to Concrete/CMU: Use standard masonry or concrete screw anchors in predrilled hole.
  4. DO NOT USE powder, air, or gas actuated fasteners or actuated fastener tools. DO NOT USE impact wrenches when fastening to or from the CFS.
- C. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.
- D. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, square long edges, Type X fire-resistant.
  1. Refer to drawings for thickness and additional requirements.
- E. Tape: Pressure sensitive adhesive coated polypropylene woven fabric. Must be mold, water, tear and UV resistant. Must be applicable in a wide temperature range (-20 degrees F).
- F. Sealants: Provide sealants as recommended by CFS manufacturer for openings within CFS system and perimeter conditions.

1. Refer to Section 079200 - JOINT SEALANTS for sealant information.
- G. Closure and Transition Accessories: Use metal or FRP angles and flat stock per standard system details.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas of this work, and project conditions with installer present for compliance with requirements for installation tolerances, substrates, CFS system conditions, and other conditions affecting performance of this Work.
- B. Examine structural wall framing to ensure that angles, channels, studs, and other structural support members have been installed within alignment tolerances required by CFS system manufacturer.
- C. Examine rough-in for components and systems penetrating CFS system to coordinate actual locations of penetrations relative to CFS systems joint locations prior to installation.
- D. Verify that mechanical and electrical services for exterior walls have been installed and tested and, if appropriate, verify that adjacent materials and finishes are dry and ready to receive insulation.
- E. Proceed with installation only after wall substrate surfaces have been properly prepared and unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by CFS manufacturer for achieving best result for substrate under project conditions.
- C. Prepare sub-framing, base angles, sills, furring, and other CFS system members and provide anchorage in accordance with ASTM C754 for substrate type and wall cladding type in accordance with manufacturer's installation instructions.

### 3.03 INSTALLATION

- A. Install CFS system in accordance with manufacturer's installation instructions.
- B. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.
- C. Trim insulation neatly to fit spaces and insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of insulation.
- E. Seal gaps, voids or penetrations completely with approved expandable foam sealant on exterior and interior (if visible) before enclosing wall.
- F. Provide spray foam to seal metal penetrations, including cantilevered fasteners, to prevent interstitial space condensation.
- G. Exposed insulation must be protected from open flame.

- H. Exterior wall insulation is not intended to be left exposed for periods of time in excess of 60 days without adequate protection.
  - 1. When extended exposure is anticipated, protect exposed insulation surfaces including corners, window and door openings with a compatible waterproof tape.
- I. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.

#### 3.04 TOLERANCES

- A. Shim and align CFS system within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb, and on location lines as indicated.

#### 3.05 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Ensure that insulation panels are not exposed to moisture.
  - 1. Remove wet insulation panels or allow them to completely dry prior to installation of CFS system.
- C. Replace damaged insulation panels prior to Date of Substantial Completion.

**END OF SECTION 074210.31**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Manufactured metal panels for soffits and interior ceilings, with related flashings and accessory components.

## 1.02 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

## 1.03 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage, and elevations indicating material type, finish and direction of rib installation..
- C. Samples: Submit two samples of wall panel and soffit panel, by 18 inch (\_\_\_\_ mm) in size or one complete 12 inch long section of panel illustrating finish color, sheen, and texture.

## 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in installing the products specified in this section with minimum five years of documented experience.
- C. Source Limitations: Obtain all components from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the Manufacturer.
  - 1. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.
  - 2. Manufacturer shall have direct authority and control over all fabrication of steel components as well as the raw materials used in their fabrication.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Manufacturer's responsibilities:
  - 1. All panels shall be shipped from the manufacturer with polystyrene or similar cushioned packaging material separating the individual panels to minimize flexing, stressing, scratching or otherwise damaging the material during transit to the job.
  - 2. Fully cover materials with tarpaulins or similar protective cover during transit to prevent dirt and debris from coming in contact with the finished goods.
- B. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.
- C. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- D. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.



- E. Prevent contact with materials that may cause discoloration or staining of products.

#### 1.06 WARRANTY

- A. See Section 017800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.
- B. Correct defective Work within a five year period after the Date of Substantial Completion, including defects in water tightness and integrity of seals.
- C. Additional Special Warranties:
  - 1. Manufacturer's standard twenty (20) year finish warranty covering checking, crazing, peeling, chalking, fading, or adhesion.
  - 2. Installer's two (2) year warranty covering panel system installation.
- D. Warranties shall commence on date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Metal Soffit Panels:
  - 1. ATAS International, Inc; Opaline- OPF: [www.atas.com/sle](http://www.atas.com/sle).
    - a. Finish: KYNAR 500 PVDF. Finish thickness shall provide a 1.0 mil dry film thickness consisting of a primer and finish color coat.
    - b. Color shall be as selected by the Architect from the manufacturers full color offering.
  - 2. Or approved equal

#### 2.02 MANUFACTURED METAL PANELS

- A. Exterior Vented Soffit Panels:
  - 1. Basis of Design: ATAS International, Inc. - or approved equal.
    - a. Profile: Horizontal; MPV120 style as indicated or selected by the Architect.
    - b. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
    - c. Material: Precoated aluminum sheet, 18 gage, 0.0403 inch (1.02 mm) minimum thickness.
    - d. Panel Width: 12" inches (\_\_\_ mm) as selected by the Architect.
    - e. Color: As selected by Architect/Engineer from manufacturer's full line.
- B. Interior Ceiling Soffit Panels:
  - 1. Profile: OPF Interlocking joints.
  - 2. Material: ASTM B209, 3105-H14 alloy, solid and perforated precoated aluminum sheet, 20 gage, 0.032 inch (0.81 mm) minimum thickness. Locate perforated (vented) panels where indicated on the drawings.
  - 3. Panel Width: 8"
  - 4. Color: As selected by Architect/Engineer from manufacturer's full line.
- C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
  - 1. Provide mitered internal corners, back braced with 18 gage, 18 inch (\_\_\_ mm) thick precoated metal sheet to maintain continuity of profile.
- D. Expansion Joints: Same material, thickness and finish as exterior sheets; 18 gage, 18 inch (\_\_\_ mm) thick; manufacturer's standard brake formed type, of profile.

- E. Trim, Closure Pieces, Flashings, and flat stock material: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- F. Anchors: Aluminum or Stainless steel.

### 2.03 MATERIALS

- A. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, H14 smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

### 2.04 ACCESSORIES

- A. Sealants:
  - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
  - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
  - 3. Color: Color of sealants shall match the approved panel color unless directed otherwise by the Architect.
- B. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Exposed fasteners same finish as panel system.
  - 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
  - 2. Products:
    - a. ITW Commercial Construction North America; Teks Select Series: [www.ITWBuildex.com](http://www.ITWBuildex.com).
- C. Field Touch-up Paint: As recommended by panel manufacturer.
- D. Bituminous Paint: Asphalt base.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that building framing members are ready to receive panels.

### 3.02 PREPARATION

- A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

### 3.03 INSTALLATION

- A. Install panels on soffits in accordance with manufacturer's instructions.
- B. Manufacturer shall provide all details on their shop drawings provided to the contractor; the manufacturer approved installation contractor shall install soffit and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- C. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- D. Install metal soffit panels over the completed soffit substrate fastened into the structural substrate with compatible / non-corrosive screw type fasteners at twelve (12) inches o.c.

maximum spacing along each panel seam, unless a closer spacing is required by the manufacturer to meet local wind loading conditions.

- E. Fasten panels to structural supports; aligned, level, and plumb.
- F. Locate joints over supports. Lap panel ends minimum 2 inches (51 mm).
- G. Provide expansion joints where indicated.
- H. Coordinate flashing and sheet metal work to provide weathertight conditions at soffit terminations. Fabricate and install in accordance with standard of SMACNA Manual.
- I. Use concealed fasteners unless otherwise approved by Architect/Engineer.
- J. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

#### 3.04 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch (3.2 mm).

#### 3.05 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water in accordance with the manufacturer's directions.
- C. Replace damaged work than cannot be restored by normal cleaning methods.
- D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

**END OF SECTION 074216**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
  - 1. Fleece Backed ethylene-propylene-diene-monomer (EPDM) roofing system.
  - 2. Roof edge systems.
  - 3. Vapor retarder.
  - 4. Roof insulation.

1.03 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.04 SUBSTITUTIONS / OR EQUALS

- A. Substitutions or Equals for the roofing material manufacturer and items listed in this specification shall be submitted in conformance with Division 1 and as otherwise modified by the following:
  - 1. A proposed Substitution/or Equal submission package must be submitted to the Architect no later than ten (10) business days prior to the bid date. Otherwise, any Substitution/or Equal other than the manufacturer specified will not be considered.
  - 2. Submittal to Architect must include:
    - a. Identification of Project - Project Name;
    - b. Name of Submitting Bidder;
    - c. Telephone and Email address of Submitting Bidder;
    - d. Manufacturer's Name of Proposed or Equal/Substitution;
    - e. Model, line or material type;
    - f. Equivalent line by line item comparison for each item listed in the materials section of this specification, including each of the optional accessories. Note: Each proposed item must have proposed manufacturer and model/product numbers.
    - g. Addresses of two locations within 30 miles of the proposed site, where the proposed Substitution/or Equal manufacturer has installed their similar roofing product and name and telephone number of a contact person to be able to arrange a site visit.
    - h. A copy of the final signed warranty signed and issued by the manufacturer for the two projects provided.
  - 3. Partial and/or Failure to follow any of the procedures outlined in division 1 or above may subject the entire submission for rejection.
  - 4. Incomplete submissions may not be reviewed.
  - 5. Substitution/ or Equals if found acceptable will be approved via addenda, which will be issued to all bidder's.
  - 6. In order to include an approved Substitution/or Equal in the bid, the bidder must acknowledge on the bidders bid form that the bidder intends to provide the approved Substitution/or Equal and the bidder shall also list the name of the approved Substitution/or Equal manufacturer as well on the bidders bid form. Failure of the bidder to express their intent to use the approved Substitution/or Equal as part of the bid will exclude the bidder from being able to utilize another Manufacturer from the one specified.
  - 7. If a bidder uses a Substitution/or Equal, the bidder will take responsibility to pay for the re-engineering and coordination of all other items that are to be provided that have been

defined in the Contract Documents as additional items to the roofing system, including but not limited to all deck preparation/modifications, additional flashings or modification to existing roof drains.

#### 1.05 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  - 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review the use and staging of hoisting equipment required for the project including safety , OSHA regulations pertaining to operation and use of this equipment.
  - 5. Review Contractor's (and their Subcontractor's) responsibility to comply with OSHA regulations, requirements for provision and implementation of safety equipment and regulations. Additionally, Contractor shall keep on-site at all times a minimum of three complete additional safety units (i.e.: harnesses, rigging gear, hardhats, safety vests, etc.) for use by site visitors requiring access to the work.
  - 6. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
  - 7. Review structural loading limitations of roof deck during and after roofing.
  - 8. Review the location of any fresh-air intakes for the building with the building owner which may have to be covered or re-directed to maintain intakes during roofing operations.
  - 9. Review base flashings, special roofing details, roof drainage, roof penetrations; raising and/or replacement of equipment curbs, disconnection and re-connection of mechanical roof mounted equipment; and condition of other construction that affects roofing system.
  - 10. Review governing regulations and requirements for insurance and certificates if applicable.
  - 11. Review temporary protection requirements including but not limited to safety lines, roof barriers, walkway protections as required by OSHA during and after roofing installations.
  - 12. Review roof installation observations during construction; notifications and repair procedures after roofing installation with the manufacturer's field representative.

#### 1.06 ACTION SUBMITTALS

- A. Submittals shall be made in accordance with Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product.
- C. Shop Drawings: For roofing system. Include plans, sections, details, and attachments to other work, including:
  - 1. Base flashings and membrane terminations including laps, seam layout, direction of laps and flashing details.
  - 2. Tapered insulation, including slopes.
  - 3. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacing and patterns for mechanically fastened roofing.
  - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Manufacturers complete installation Instructions.
- E. MSDS Sheets for all materials.

#### 1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  - 1. Submit evidence of complying with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Sample Warranties: For manufacturer's special warranties.

#### 1.08 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

#### 1.09 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Single Source Responsibility: Roofing system materials and components shall be supplied and warranted by membrane manufacturer for specified roofing system and specified membrane manufacturer's warranty and shall be in compliance with specified regulatory requirements.
- C. Regulatory Requirements for Roof Assembly:
  - 1. Comply with Factory Mutual System Approval Guide to provide FMRC-Approved roof assembly meeting Class IA- 90 (FM Standard 4470) requirements for fire resistance and wind uplift in accordance with FM Loss Prevention Data Sheets 1-28 and 1-29.
  - 2. Underwriters Laboratories, Inc. (UL): Class A Fire Hazard Classification
  - 3. Conform to applicable code(s) for roof assembly fire hazard requirements.
  - 4. Conform to loading requirements indicated in ASCE 7 for applicable building location, exposure and use.
  - 5. Factory Mutual (FM) 1-90 Compliance/Roof Assembly.
- D. Qualifications.
  - 1. Manufacturer: Company specializing in manufacturing the products specified in this section with 10 years documented experience.
  - 2. Applicator: Company specializing in performing the work of this section with 5 years documented experience. Installer shall be a qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
2. All curable materials must be stored between 60° F and 80°F.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.
- E. Protect adjacent materials and surfaces against damage from roofing work. Do not store materials on previously completed roofing.

#### 1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

#### 1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.
  2. Warranty Period: 30 years from date of Substantial Completion with no dollar limitation (NDL) on the cost or quantity of repairs. Pro-rated roofing warranties will not be accepted.
  3. The warranty shall include coverage for wind speed with peak gusts of 120 mph measured at 30 feet above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.
  4. Warranty shall also provide coverage for roof leakage caused by hail up to and including 2 inch in diameter. An additional 1 inch shall be provided for roofs installed with the flexible FAST system.
  5. Materials and Workmanship for the following items shall be included in the manufacturer's warranty:
    - a. Membranes.
    - b. Flashings, including metal flashings and accessories supplied by roofing membrane manufacturer.
    - c. Insulation.
    - d. Fasteners and adhesives.
    - e. Accessories.
    - f. Roof drains.
    - g. Roof Edge and coping systems.
  6. The warranty deliverables shall include the following:
    - a. Original of the warranty with original signature of a roofing manufacturer's company official authorized to sign the warranty.
    - b. An additional three copies of the signed warranty noted above.
    - c. Record set of as-built roofing drawings.
    - d. Final Roof Inspection Report by the manufacturer's authorized Field Representative.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation for roofing system from manufacturer approved by membrane roofing manufacturer.

### 2.02 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
  - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G155.
  - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
  - 1. Field of Roof Uplift Pressure: 50 lbf/sq. ft. (kPa/sq. m).
  - 2. Perimeter Uplift Pressure: 60 lbf/sq. ft. (kPa/sq. m).
  - 3. Corner Uplift Pressure: 80 lbf/sq. ft. (kPa/sq. m).
- D. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.
- E. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

### 2.03 EPDM ROOFING

- A. Fleece-Backed EPDM: ASTM D 4637, Type III, non-reinforced, uniform, flexible EPDM sheet, laminated to a nonwoven polyester fabric backing except at selvages. Sheets shall be ten foot wide in maximum lengths provided by the manufacturer.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Carlisle SynTec Incorporated.
    - b. Versico Incorporated
  - 2. Membrane thickness: 90 mils.
  - 3. Fleece Backing: Non-woven Polyester, 55 mils thick.
  - 4. Exposed Face Color:
    - a. Black to be used at Roof Area 6
    - b. White to be used at Roof Areas 4 & 5



## 2.04 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
  - 1. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Gypsum Board and Panel Adhesives: 50 g/L.
    - c. Multipurpose Construction Adhesives: 70 g/L.
    - d. Fiberglass Adhesives: 80 g/L.
    - e. Single-Ply Roof Membrane Adhesives: 250 g/L.
    - f. Single-Ply Roof Membrane Sealants: 450 g/L.
    - g. Non-membrane Roof Sealants: 300 g/L.
    - h. Sealant Primers for Nonporous Substrates: 250 g/L.
    - i. Sealant Primers for Porous Substrates: 775 g/L.
    - j. Other Adhesives and Sealants: 250 g/L.
- B. Protection Sheet: Epichlorohydrin or neoprene non reinforced flexible sheet, 55 to 60-mil thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
- C. Bonding Adhesive, splice cleaners, splice cement and splice tape: Manufacturer's standard.
- D. Prefabricated Control or Expansion Joint Flashing: Type approved for the total roof system by roofing manufacturer.
- E. Low-Rise, Urethane, Fabric-Backed Membrane Adhesive: Roof system manufacturer's flexible FAST spray-applied, low-rise, two-component urethane adhesive formulated for compatibility and use with fleece-backed membrane roofing.
- F. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6 inch wide minimum, butyl splice tape with release film.
- G. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- H. Molded Pipe Flashings inside and outside corner flashing: as recommended by membrane manufacturer.
- I. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- J. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.
  - 1. Provide white flashing accessories for white EPDM membrane roofing.
- L. Walkway Pads: Protective surfacing for roof traffic shall be non-slip textured, pressure-sensitive walkway pads (with Factory-Applied Tape on the underside of the walkway) adhered to the membrane surface in conjunction with primer. Color to match roofing.

## 2.05 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

## 2.06 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Atlas Roofing Corporation.
    - b. Carlisle Syntec Systems: InsulBase POLYISO insulation.
    - c. Hunter Panels
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to minimum slope of 1/4 inch per 12 inches (1:48) for new roof installations. Minimum LTTR-30, 4' x 4' board size.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated or at least twice the slope of the tapered insulation in the field of the roof areas.

## 2.07 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
  - 1. Modified asphaltic, asbestos-free, cold-applied adhesive.
  - 2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
  - 3. Full-spread spray-applied, low-rise, two-component urethane adhesive.
- D. Cover Board: ASTM C1278/C1278M, cellulosic-fiber reinforced, water-resistant gypsum substrate, 1/2 inch thick.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. USG Corporation; Securock Gypsum-Fiber Roof Board.
- E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  - 2. Verify that perimeter wood blocking, curbs, and nailers are securely anchored to roof deck at roof perimeters, penetrations and terminations in accordance with Factory Mutual 1-49 requirements and that nailers match thicknesses of insulation .
  - 3. Steel Decks: Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 - STEEL DECKING, as applicable.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

### 3.03 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.04 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

### 3.05 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.

- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
  - 1. Where installing composite and non-composite insulation in two or more layers, install non-composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
  - 2. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
  - 3. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
  - 1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
  - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

### 3.06 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere fabric-backed roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow membrane to relax before installing.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written

instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.

- H. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.
- J. Adhere protection sheet over membrane roofing at locations indicated.

### 3.07 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Manufacturer's Field Services: The manufacturer's authorized Field Representative and Roofing Quality Control Inspector shall provide the following:
  - 1. Attend and conduct Pre-installation Meeting.
  - 2. Perform preparatory, initial, follow-up and final inspections for roof insulation and roofing system.
  - 3. Prepare and submit inspection reports for each inspection made.
- C. Upon completion of the installation the manufacturer's authorized Field Representative shall conduct an on-site inspection in the presence of the Architect/Engineer to insure that the installation has been installed in accordance with the manufacturer's specifications.
- D. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
  - 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
  - 2. Flood each area for 24 hours.
  - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
- E. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- F. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- G. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

### 3.09 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for

deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION 075323.13**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Formed roof-drainage sheet metal fabrications.
  - 2. Formed steep-slope roof sheet metal fabrications.
  - 3. Drip edges.
  - 4. Base and Counter flashing.
  - 5. Through-wall flashing.

## 1.03 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

## 1.04 REFERENCES:

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- C. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012 (Reapproved 2019).
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

## 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Detail fabrication and installation layouts, details. Distinguish between shop- and field-assembled work.
  - 2. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 3. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 5. Include details of termination points and assemblies.
  - 6. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
  - 7. Include details of roof-penetration flashing.
  - 8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
  - 9. Include details of special conditions.

10. Include details of connections to adjoining work.

C. Samples for Verification: For each type of exposed finish.

#### 1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping, scupper, roof edge and flashing required to complete the roofing system. All sheet metal shall be SPRI ES-1 tested and FM approved for this project.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

#### 1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

C. Perform work in accordance with SMACNA (ASMM), CDA A4050, and approved manufacturers requirements and standard details, except as otherwise indicated.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

#### 1.09 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
  - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
  - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
  - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. roof edges, counterflashing, and other components incorporated or in contact with the Roofing System shall be pre-approved by and made integral to the 20-year Total Roofing System warranty specified in Division 07. Shop drawings and components shall be reviewed and approved by the Roofing manufacturer prior to submittal to the architect for approval. Submit a letter signed by a current representative of the manufacturer on Roofing manufacturer letterhead, attesting to this approval and warranty acceptability. Submit this certification letter as part of the Shop Drawing submittals for this section.



## PART 2 - PRODUCTS

## 2.01 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated or required by the approved roofing manufacturer responsible for providing the Total System Warranty for the roof system.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. FM Approvals Listing: Manufacture and install copings, roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-180 Identify materials with name of fabricator and design approved by FM Approvals.
- E. SPRI Wind Design Standard: Manufacture and install Roof edges, Counterflashing, and other components of roof metal work tested according to SPRI ES-1 and capable of resisting the required design pressure.
- F. Recycled Content of Copper-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material

## 2.02 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
  - 1. Thickness: 0.040 inch minimum or as indicated on the drawings.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - b. Color: as selected by the Architect from the manufacturer's full range of color offerings.
  - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Stainless Steel: ASTM A666, Type 304, soft temper, 28 gage thick; smooth No. 4 finish.

- D. Terne Coated Steel: 28 gage (0.0149 inch) thick copper bearing carbon steel core material with 0.092 lb/sq ft terne alloy coating on both sides of core metal.
- E. Terne Coated Stainless Steel: 28 gage (0.0156 inch) ASTM A666 Type 304 core material with 0.092 lb/sq ft terne alloy coating on both sides of core metal.

### 2.03 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; non-perforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Grace Construction Products, a unit of W. R. Grace & Co.-Conn; Grace Ice and Water Shield HT.
    - b. Henry Company; Blueskin PE200 HT.
  - 2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F or higher.
  - 3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

### 2.04 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

## 2.05 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.
  - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

## 2.06 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
  - 1. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
- B. Drip Edges: Fabricate from the following materials:
  - 1. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
- C. Eave, Rake Flashing: Fabricate from the following materials:
  - 1. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
  - 1. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
- E. Flashing Receivers: Fabricate from the following materials:
  - 1. Stainless Steel: 22 gauge
- F. Roof-Penetration Flashing: Fabricate from the following materials:

1. Aluminum: 0.050 inch thick. Finish color as selected by the Architect.

## 2.07 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings: Fabricate head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings. Form head and sill flashing with 2-inch (50-mm-) high, end dams. Fabricate from the following materials:
  1. Stainless Steel: 22 gauge

## 2.08 MISCELLANEOUS FLASHINGS - COORDINATED SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
  1. Stainless Steel: 0.018 (26 gauge) thick.
  2. Aluminum Sheet: 0.040 inch thick. Finish color as selected by the Architect.
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:
  1. Stainless Steel: 0.018 inch thick (26 gauge) thick.
  - 2.

## 2.09 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  1. Verify compliance with requirements for installation tolerances of substrates.
  2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

## 3.03 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  - 5. Torch cutting of sheet metal flashing and trim is not permitted.
  - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
  - 1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as required for watertight construction.
  - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
  - 1. Do not solder aluminum sheet.
  - 2. Do not use torches for soldering.
  - 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  - 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

### 3.04 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.05 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04.
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings.

### 3.06 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

### 3.07 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.08 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 076200**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured sheet metal items, including manufactured sheet metal louver dormers.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood nailers for sheet metal work.
- B. Section 061000 - Rough Carpentry: Field fabricated roof curbs.
- C. Section 073113 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.
- D. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- F. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012 (Reapproved 2019).
- G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- H. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2016.
- I. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- J. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).
- K. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- L. CDA A4050 - Copper in Architecture - Handbook; current edition.
- M. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.



#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

#### 1.05 SUBMITTALS

- A. See Section 013300 - SUBMITTALS for submittal procedures.
- B. Shop Drawings: For manufactured roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work. Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples, 6 x 6 inch (\_\_\_\_by\_\_\_\_ mm) in size illustrating material and finish.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
  - 1. Size and location of roof accessories specified in this Section.
  - 2. Method of attaching roof accessories to roof or building structure.
  - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
  - 4. Required clearances.
- B. Warranty: Sample of special warranty.

#### 1.07 PERFORMANCE REQUIREMENTS

- A. General Performance: Manufactured roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

#### 1.08 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer protective cartons individually on pallets in a protected area until they are ready to be installed.
- B. Prevent contact with materials that could cause discoloration or staining.

#### 1.10 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
  - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
  - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufactured Sheet Metal Roof Accessories Manufacturers:
  1. CopperCraft  
404 E. Dallas Road, Grapevine, TX 76051  
T: 800.486.2723  
E: info@CopperCraft.com
  2. K & M Sheet Metal & Gutter Supply.
  3. Architect Approved equivalent

### 2.02 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gauge, 0.032 inch (0.81 mm) thick; plain finish shop pre-coated with modified silicone coating.
  1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
  2. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
  3. Color: As selected by the Architect from the manufacturer's full color offering.

### 2.03 FABRICATION

- A. Manufactured items listed in this section shall be fabricated in the manufacturer's plant to the greatest extent possible. Manufacturer will provide watertight and concealed connection details for those items required to be fabricated in sections due to shipping limitations. Manufacturer shall provide installation instructions, hardware, sealants, solder and fasteners as required to achieve a complete and watertight field installation.

### 2.04 LOUVERS

- A. Manufactured Louver units, hand-crafted in the factory with integral insect screens, drainable louver blades in profiles, shapes and sizes as indicated on the drawings.
  1. Material: Aluminum.
  2. Color: Color as selected by the Architect from the manufacturer's full color offering
  3. Louver Design: Gable
  4. Louver Depth: 4 inch.
  5. Size(s): 36 inches wide by 18 inches high.
  6. Free Area: As determined by manufacturer's Product Data based on Louver Size indicated.

### 2.05 CUPOLAS

- A. Manufactured Cupola Units shall be self-contained, pre-fabricated units with base flashing and roof cut configuration to accommodate the roof pitch as indicated on the drawings and confirmed by field measurements prior to fabrication. Matching metal fasteners shall be provided to connect the Cupola(s) to the building structure to withstand local code wind loading requirements. Larger dormers shall be provided with a pre-engineered aluminum frame, plywood substrate and metal cladding in material specified or indicated on the drawings.

1. Material: 20 ounce Copper.
2. Color: Natural Metal.
3. Cupola Design: As indicated on the drawings.
4. Type: Louvered with 2 inch deep louvers and insect screens.

#### 2.06 CHIMNEY POTS AND CAPS

- A. Manufactured Chimney Pots and Caps shall be hand crafted at the factory to comply with local codes and shall have received prior written approval by the fireplace or stove manufacturer specified. Approval letter shall be submitted to the Architect with manufacturer's product data submissions. Stamped Screen material shall match the Cap material construction.
  1. Material: 20 ounce Copper.
  2. Color: Natural Metal.
  3. Cap Design: Design as indicated on the drawings.

#### 2.07 SPIRES

- A. Manufactured Spires shall be hand crafted at the factory in the design indicated on the drawings and noted herein. Units shall be fabricated with a hollow base and complete with modifications required to accommodate copper cable lightning arresting systems.
  1. Material: 20 ounce Copper.
  2. Color: Natural Metal.
  3. Spire Design: Custom design as indicated on the drawings.

#### 2.08 ACCESSORIES

- A. Fasteners: Copper, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type II (No. 30).
- C. Slip Sheet: Rosin sized building paper.
- D. Primer: Zinc chromate type.
- E. Concealed Sealants: Non-curing butyl sealant.
- F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- G. Plastic Cement: ASTM D4586/D4586M, Type I.
- H. Solder: ASTM B32; Sn50 (50/50) type or as required by the manufacturer.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

- E. Verify roof conditions, type, conditions and pitch in the field prior to developing Shop Drawings.

### 3.02 INSTALLATION

- A. General: Install manufactured roof accessories in accordance with manufacturer's written instructions, specifications and approved shop drawings.
  - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
  - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  - 1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
  - 3. Bed flanges in thick coat of roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Secure flashings in place using concealed fasteners.
- D. Solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

### 3.04 REPAIR AND CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.
- B. Clean off excess sealants.
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

**END OF SECTION 076225**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Pre-finished aluminum downspouts and accessories.

## 1.02 REFERENCES

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

## 1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations and installation details.

## 1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable code(s) for size and method of rain water discharge.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.
- B. Stack preformed and prefinished material to prevent twisting, bending or abrasion, and to provide ventilation. Slope to drain.
- C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

## 1.06 - COORDINATION

- A. Coordinate work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Gutters and Downspouts:
  - 1. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc;
    - a. Designer Series Gutter System; Colonial Gutter
  - 2. Or approved equal

## 2.02 MATERIALS

- A. Aluminum: ASTM B209, 3003 alloy, H14 temper; 0.050 inch thickness or as indicated; mill finish interior, shop pre-coated Kynar 500 or Hylar 5000 finish, color to match existing structure.

### 2.03 COMPONENTS

- A. Gutters: SMACNA style profile seamless, Style Colonial , Size: 6 inch
- B. Downspouts: SMACNA round profile seamless 4 inch x 4 inch. Configure with soldered elbow offsets to provide minimal clearance to structure while providing allowance for concealed connectors.
- C. Color to be selected by Architect from manufacturer's full range.

### 2.04 ACCESSORIES

- A. Anchorage Devices: Concealed Type recommended by manufacturer.
- B. Gutter Supports: Hidden flanges screwed to fascia and interlocked / fastened to the top front edge of gutter.
- C. Downspout Supports: Flat 1 1/4" min. width concealed straps matching leader profile and color.
- D. End Caps, Elbows: Fabricate to gutter profile with factory soldered connections.
- E. Fasteners: Aluminum finish exposed fasteners same as leader metal.
- F. Leaf Screen: 10 gauge welded screen, galvanized after fabrication, sized to fit and cover entire length of gutter with gaps.
- G. Primer: Zinc chromate type.
- H. Protective Backing Paint: Bituminous.

### 2.05 FABRICATION

- A. Form gutters and downspouts of profiles and sizes indicated in accordance with approved shop drawings.
- B. Fabricate with required connection, expansion and splice pieces.
- C. Form sections square in required profile, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints and at intervals required by the manufacturer.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

### 2.06 FINISHES

- A. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install gutters, downspouts and accessories in accordance with manufacturer's instructions and approved shop drawings.
- B. Slope gutters 1/8 inch per foot minimum to leader locations.
- C. Seal metal joints other than factory welded joints watertight.
- D. Provide leader strap connections at 5'-0" maximum with a minimum of at least two connections per section.
- E. All gutter hangers shall be installed and fastened at 30 inches o.c. maximum.

**END OF SECTION 077123**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required for the correct installation of non-penetrating, recycled rubber rooftop supports for piping and ductwork systems.

## 1.02 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.
- B. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- C. ASTM C531 – Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, Monolithic Surfaces, and Polymer Concretes
- D. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.
- E. ASTM C672 – Test Methods for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015, with Editorial Revision (2017).
- G. ASTM D395 - Standard Test Methods for Rubber Property--Compression Set; 2018.
- H. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.
- I. ASTM D573 - Standard Test Method for Rubber — Deterioration in an Air Oven; 2004 (Reapproved 2019).
- J. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2014.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

## 1.03 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for Submittal Procedures.

## 1.04 QUALITY ASSURANCE

- A. Rubber / steel pipe supports shall be manufactured under a strict quality control program assuring quality product delivered to the jobsite. Pipe supports that are damaged shall not be installed.
- B. Workmanship: All rooftop supports to be installed by a qualified contractor and installed in accordance with manufacturer's recommendations.
  - 1. All work shall comply with all applicable federal, state, and local codes and laws having jurisdiction.



2. All work shall conform to accepted industry and trade standards for pipe, and ductwork installations.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with these specifications, rooftop support systems shall be Dura-Blok™ design as supplied by Eaton or approved equal.

### 2.02 MATERIALS

- A. Curb base shall be made of 100% recycled rubber and polyurethane prepolymer with a uniform load capacity of 500 pounds per linear foot of support\*. In addition, each base to have a reflective red stripe. (\*See 3.01(C))
- B. Steel frame: Steel, strut galvanized per ASTM A653 or strut galvanized per ASTM A653 for bridge series.
- C. Attaching hardware: Zinc-plated threaded rod, nuts and attaching hardware per ASTM B633.
- D. Rooftop support system products shall meet or exceed the physical and performance characteristics as specified below:
  1. Density: 0.52 oz/cu in. ASTM D575
  2. Durometer Hardness: 67.2A ± 1. ASTM D575
  3. Tensile Strength: 231 psi minimum. ASTM D575
  4. Compression Deformation: 5% at 70psi and 72°F. ASTM D395.
  5. Brittleness at Low Temp: -50°F. ASTM D746.
  6. Weathering: 70 HOURS AT 120°F. ASTM D573.
    - a. Hardness Retained: 100% (±5%)
    - b. Compressive strength: 100% (±5%)
    - c. Tensile strength: 100% (±5%)
    - d. Elongation retained: 100% (±5%)

### 2.03 TYPE OF ROOFTOP SUPPORTS

- A. Extendable height pipe support – Dura-Blok™ model DBE 10-12, height to suit application: 12 inch (200 pound maximum load). Support shall consist of a 4-inch high rubber base with two (2) ½"-13 electro zinc all threaded rod risers and a 1" high galvanized slotted channel. Length of support to extend a minimum of 2-inches from each side of the pipe supported. Consult manufacturer as heavier loads may require CLDP load distribution plate.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations. Coordinate overall dimensions of supports and pipe/duct to be supported in field with manufacturer prior to ordering.
- B. Piping shall be elevated not less than 12 inches above the roof surface.
- C. Consult roofing manufacturer for roof membrane compression capacities. Provide a compatible sheet of roofing material (rubber pad) installed under rooftop support to disperse concentrated loads and add enhance membrane protection.

- D. Support gas piping at intervals not exceeding the spacing specified in the Table below in accordance with the New York State Fuel Gas Code.

| <b>Steel Pipe, Nominal Size of Pipe (Inches)</b> | <b>Maximum Horizontal Spacing of Supports (Feet)</b> |
|--------------------------------------------------|------------------------------------------------------|
| 1/2                                              | 6                                                    |
| 3/4 or 1                                         | 8                                                    |
| 1-1/4 or Larger                                  | 10                                                   |

- E. Support hydronic piping systems at intervals not exceeding the spacing specified in the Table below in accordance with the New York State Mechanical Code, or in accordance with ANSI/MSS SP-58. Hydronic piping systems shall include steam, hot water, chilled water, steam condensate, and ground source heat pump loop systems.

| <b>Piping Materials</b>                                    | <b>Maximum Horizontal Spacing of Supports (Feet)</b> |
|------------------------------------------------------------|------------------------------------------------------|
| ABS Pipe                                                   | 4                                                    |
| Aluminum Pipe and Tubing                                   | 10                                                   |
| Cast-Iron Pipe                                             | 5                                                    |
| Copper or Copper-Alloy Pipe                                | 12                                                   |
| Copper or Copper-Alloy Tubing                              | 8                                                    |
| CPVC Pipe or Tubing, 1-Inch and Smaller                    | 3                                                    |
| CPVC Pipe or Tubing, 1-1/4 Inches and Larger               | 4                                                    |
| Lead Pipe                                                  | Continuous                                           |
| PB Pipe or Tubing                                          | 2-2/3 (32 Inches)                                    |
| PE-RT, 1-Inch and Smaller                                  | 2-2/3 (32 Inches)                                    |
| PE-RT, 1-1/4 Inches and Larger                             | 4                                                    |
| PEX Tubing, 1-Inch and Smaller                             | 2-2/3 (32 Inches)                                    |
| PEX Tubing, 1-1/4 Inches and Larger                        | 4                                                    |
| Polypropylene (PP) Pipe or Tubing, 1-Inch and Smaller      | 2-2/3 (32 Inches)                                    |
| Polypropylene (PP) Pipe or Tubing, 1-1/4 Inches and Larger | 4                                                    |
| PVC Pipe                                                   | 4                                                    |
| Steel Tubing                                               | 8                                                    |
| Steel Pipe                                                 | 12                                                   |

- F. Use properly sized clamps to suit pipe and conduit sizes.

**END OF SECTION 077201**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to Work of this Section.

## 1.02 SUMMARY

- A. This section includes pre-manufactured equipment rails for vehicle exhaust system fans.

## 1.03 RELATED SECTIONS INCLUDE THE FOLLOWING:

- A. Section 075323.13 – Ethylene-Propylene-Diene-Monomer (EPDM) Roofing – Fleeceback

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 – Submittal Procedures.
- B. Submit pursuant to Section 016100 – Product Requirements.
- C. Shop Drawings: Show relationship with adjoining Work and anchorage methods. Include plans, sections, and details.
- D. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions.

## 1.05 SEQUENCING AND SCHEDULING

- A. Coordinate installation of roof curbs (rails) with all roofing and flashing work.

## PART 2 PRODUCTS

## 2.01 EQUIPMENT RAILS

- A. Prefabricated Equipment Rails shall be Model ER-4A manufactured by Roof Products and System Corp, Bensenville, IL.
  - 1. "R" dimension shall equal roof insulation thickness.
  - 2. Overall Height shall equal roof insulation thickness plus 12" unless noted
  - 3. otherwise.
  - 4. Top width shall equal 6" unless noted otherwise.
  - 5. Two appropriately sized rails required for each rooftop unit, including but not limited to Vehicle Exhaust system fan units and condensing units.
    - a. Size and location to be coordinated with vehicle exhaust vendor

## PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Install units in accordance with the manufacturer's instructions, unless shown otherwise on the Drawings. Securely anchor units.
- B. Where mounting flanges are set directly in the roofing, embed the flanges in roofing cement or other waterproof mastic or adhesive as recommended by the manufacturer of the roofing

**END OF SECTION 077213**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work on this Section.

## 1.02 SUMMARY

- A. This Section includes thermally broken roof hatches and roof hatch guard rail systems.
- B. Related Sections include the following:
  - 1. Section 055133.13 – Fixed Metal Ladders
  - 2. Section 061000 - Rough Carpentry
  - 3. Section 075323.13 – Ethylene-Propylene-Diene-Monomer (EPDM) Roofing – Fleeceback

## 1.03 STANDARDS

- A. All work of this section shall confirm to industry standards and/or manufacturer's recommendations.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016100 - Product Requirements.
- C. Product Data: Manufacturer's technical data for each type of hatch assembly, including setting drawings, templates, finish requirements, anchorage details, latching and locking provisions, insulation values and other pertinent data.
- D. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.
- E. Warranty: Submit executed copy of manufacturer's standard warranty with closeout documents.
- F. Contract Closeout Submittals: Installation, Operating and Maintenance manuals.

## 1.05 QUALITY ASSURANCE

- A. Experienced workmen familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this section.
- B. Manufacturer: A minimum of 5 years' experience manufacturing similar products.
- C. Installer: A minimum of 2 years' experience installing similar products.

## 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.

## 1.07 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505, Phone 800-366-6530. (Basis of Specification)
- B. Babcock-Davis, 9300 73rd Ave N., Brooklyn Park, MN 55428, Phone 888-412-3726
- C. Architect approved equivalent with Thermal Break.

## 2.02 ROOF HATCH

- A. Furnish and install where indicated on plans, aluminum roof hatch. Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.
  - 1. BILCO Type S-50TB 36" W x 30" L.
- B. Performance characteristics:
  - 1. Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
  - 2. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/15th of the span or 20 psf wind uplift.
  - 3. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
  - 4. Operation of the cover shall not be affected by temperature.
- C. Cover: Shall be 11-gauge (2.3 mm) aluminum with a 5" beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- D. Cover insulation: Shall be 3" thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m2K), fully covered and protected by an 18-gauge (1 mm) aluminum liner.
- E. Curb: Shall be 12" in height and of 11-gauge (2.3 mm) aluminum, interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 5 1/2" flange with 1/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6" on center, to be bent inward to hold single ply roofing membrane securely in place.
- F. Curb insulation: Shall be 3" thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m2K).
- G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of

moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

H. Hardware

1. Heavy stainless steel pintle hinges shall be provided.
2. Cover shall be equipped with a spring latch with interior and exterior turn handles.
3. Roof hatch shall be equipped with interior and exterior padlock hasps.
4. The latch strike shall be stamped component bolted to the curb assembly.
5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.
7. Finishes: Factory finish shall be mill finish aluminum.

2.03 HATCH RAIL SYSTEM

- A. Furnish and install on all roof hatches, hatch rail system designed to fit each roof hatch. The hatch rail system shall be field assembled and installed per the manufacturer's instructions.
- B. Performance characteristics:
1. High visibility safety yellow powder coat paint finish.
  2. Hatch rail system shall attach to the cap flashing of the roof hatch and shall not penetrate any roofing material.
  3. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two.
  4. Corrosion resistant construction with a five-year warranty.
  5. Hinged gate shall ensure continuous barrier around the roof hatch.
  6. Self-closing gate hinge and positive latching system provided with hatch rail system.
- C. Posts and Rails: 1 1/4" 6061 T6 schedule 40 aluminum pipe.
- D. Hardware: Mounting brackets shall be 3/8" thick extruded aluminum. Pivoting post guides with compression fittings and latching mechanism shall be cast aluminum. Self-closing hinges and all fasteners shall be type 316 stainless steel.
- E. Provide steel ladder safety post with adjustable mounting hardware, spring balanced telescoping design, that automatically locks in the fully raised position, in Yellow Powder Coat Paint finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
1. Test units for proper function and adjust until proper operation is achieved.
  2. Repair finishes damaged during installation.
  3. Restore finishes so no evidence remains of corrective work.

3.03 ADJUSTING AND CLEANING

- A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

**END OF SECTION 077233**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.

## 1.02 SUMMARY

- A. The work of this section includes, but is not limited to, the following:
  - 1. Gusset style snow guards
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
  - 1. Section 073113 - Asphalt Shingles

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Manufacturer's Product Data: Technical product data, installation instructions and color samples.
- D. Manufacturer's Installation Instructions for each style of snow guard.
- E. Shop Drawings:
  - 1. Provide shop drawings showing dimensioned locations and layouts of all snow guards.
- F. Color Samples for Initial Selection Purposes: Submit manufacturer's color samples in the finish specified for the snow guards consisting of complete color charts representing manufacturer's full range of available colors.
- G. Selected Color Samples: Provide three (3) physical samples in the color(s) and finish selected by the Architect.

## 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with all work of this section according to manufacturer's recommendations and/or industry standards.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.



### 1.07 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

### 1.08 WARRANTY

- A. Type A Snow Guards:
  - 1. Provide manufacturer's standard material/workmanship warranty.

## PART 2 PRODUCTS

### 2.01 SNOW GUARDS

- A. Type A: PD10 half-round snow guard as manufactured by Alpine Snow Guards, 289 Harrel Street, Morrisville, VT 05661, Phone (888) 766-4273 or Architect approved equivalent.
  - 1. Material: 0.032 Aluminum.
  - 2. Finish: Kynar 500 .
  - 3. Color: As selected by the Architect from the manufacturer's full color offering.
  - 4. Layout:
    - a. Lower three rows: 24" o.c. in each shingle course. Alternate spacing by 12" in alternating course above.
    - b. Upper three rows: 48" o.c. in each shingle course. Alternate spacing by 24" in alternating course above.
  - 5. Install Type A snow guards only in areas shown on Contract Drawings.
  - 6. All exposed hardware to match.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install units in accordance with the manufacturer's instructions, unless shown otherwise on the Drawings. Securely anchor units.
- B. Isolate dissimilar metals using underlayment or bituminous paint.
- C. Where mounting flanges are set directly in the roofing, embed the flanges in roofing cement or other waterproof mastic or adhesive as recommended by the manufacturer of the roofing. On sloping surfaces, integrate mounting flanges with roofing elements to properly shed water.

**END OF SECTION 077253**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes sprayed fire-resistive materials (SFRM).

## 1.03 PRE-INSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans, schedules, or both, indicating the following:
  - 1. Extent of fireproofing for each construction and fire-resistance rating.
  - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
  - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
  - 4. Treatment of fireproofing after application.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Field quality-control reports.

## 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

## 1.07 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
  - 1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E736/E736M. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
  - 2. Density: Test for density according to ASTM E605/E605M. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
  - 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.

4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

#### 1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

#### 1.09 COORDINATION

- A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:
  1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
  2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
  3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
  4. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
  5. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction.
- E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Asbestos: Provide products containing no detectable asbestos.

## 2.02 SPRAYED FIRE-RESISTIVE MATERIALS

- A. SFRM : Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z106 & Monokote Z106/HY.
    - b. Isolatek International; Cafco Blaze-Shield HP.
    - c. Or approved equal.
  2. Bond Strength: Minimum 2,000 lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E736/E736M.
  3. Density: Not less than 22 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E605/E605M.
  4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605/E605M, whichever is thicker, but not less than 0.375 inch.
  5. Combustion Characteristics: ASTM E136 shall be non-combustible.
  6. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 10 or less.
    - b. Smoke-Developed Index: 0 or less.
  7. Compressive Strength: Material shall not deform more than 10 percent when subjected to a crushing force of 100 psi when tested in accordance with ASTM E761/E761M.
  8. Corrosion Resistance: No evidence of corrosion according to ASTM E937/E937M .
  9. Deflection: No cracking, spalling, or delamination according to ASTM E759/E759M.
  10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760/E760M.
  11. Air Erosion: Maximum weight loss of 0.000 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E859/E859M.
  12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G21.
  13. Finish: As selected by Architect from manufacturer's standard finishes Spray-textured finish.
  14. Color: Grey

## 2.03 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  2. Fireproofing manufacturer shall be contacted for procedures on handling primed / painted steel.
  3. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E736/E736M.

- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in the UL "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
  - 1. Product: Subject to compliance with requirements, provide "Cafco Bond-Seal or Cafco Bond-Seal Type X" by Isolatek International.
- H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
  - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
  - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.
- C. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

- B. Post signage "Slippery When Wet" and erect appropriate barriers to alert on-site personnel / workers of slippery conditions in the area(s) of Spray Fireproofing applications.
- C. Clean substrates of substances that could impair bond of fireproofing.
- D. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- E. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

### 3.03 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
  - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
  - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- I. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- J. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- K. Cure fireproofing according to fireproofing manufacturer's written recommendations.

- L. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- M. Finishes: Where indicated, apply fireproofing to produce the following finishes:
  - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
  - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.

#### 3.04 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Test and inspect as required by the IBC 1704.10.
  - 2. For reference, utilize AWCI - Inspection Procedure for Field-Applied Sprayed Fire Resistive Materials, Technical Manual 12-A; an annotated guide.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
  - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
  - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

#### 3.05 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Remove all Fireproofing application equipment and residual supplies from the site upon completion of the work of this section.
- C. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- D. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- E. Repair fireproofing damaged by other work before concealing it with other construction.
- F. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

#### END OF SECTION 078100

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes through-penetration Firestop systems for penetrations through fire-resistance-rated horizontal and vertical constructions, including both empty openings and openings containing penetrating items. Fire-rated joint construction in or between fire-resistance rated construction and at exterior curtain wall/floor intersections.
- B. Related Sections include the following:
  - 1. Section 099100 - Painting for stencil paint requirements.
  - 2. Divisions 21 and 22 Sections specifying piping penetrations.
  - 3. Divisions 23 Sections specifying pipe and duct penetrations.
  - 4. Divisions 25, 26 and 27 Sections specifying cable and conduit penetrations.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM E814 "Standard Test Method of Fire Tests of Penetration Firestop Systems".
- C. UL 1479 "Standard for Fire Tests of Penetration Firestops".
- D. UL "Building Materials Directory".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data: For each type of product necessary to complete all types of firestopping required on the project.
- D. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspection agency.
- E. LEED Submittal:
  - 1. Product Data for Credit EQ 4.1: For fire-sensitive joint systems, including printed statement of VOC content.
- F. Qualification Data: For qualified installer.

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration fire stopping similar in material, design, and extent to that Indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified



requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    - b. Classification markings on penetration firestopping correspond to designations listed by the following:
      - 1) FM Global in its "Building Materials Approval Guide".
      - 2) UL in its "Fire Resistance Directory".

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver through-penetration Firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspection agency's classification marking applicable to Project, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials for through-penetration Firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- C. Comply with recommended procedures, precautions or remedies described in Material Safety Data Sheets (MSDS) as applicable.
- D. Do not use damaged or expired materials.

#### 1.07 REGULATORY REQUIREMENTS

- A. Provide fire and smoke resistivity pursuant to IBC NYS and NFPA.

#### 1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration Firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration Firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration Firestop systems per manufacturer's written instructions by natural means or where this is inadequate, forced-air circulation.

#### 1.09 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration Firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, and/or cut openings to accommodate penetration firestopping.

- C. Do not cover up through-penetration Firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector and/or authorities having jurisdiction, if required.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Emerson Industrial Automation; Nelson Firestop Products.
  2. Grace Construction Products; W.R. Grace & Co. - Conn.
  3. Hilti, Inc.
  4. Tremco, Inc., Tremco Fire Protection Systems Group.
  5. USG Corporation.
  6. 3M Fire Protection Products.

### 2.02 FIRESTOPPING OF THROUGH PENETRATIONS AND VOIDS

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Fire-resistance-rated walls include fire walls, fire-barrier walls and fire partitions.
  2. F-Rating: Not less than the fire resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include ceiling membranes of roof/ceiling assemblies.
  2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
  3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Designs: Firestopping designs tested pursuant to ASTM E814 or UL 1479, and UL "Classified" for the application intended.
1. Through penetration firestops: UL category XHCR for devices; category XHEZ for systems.
  2. Fill void, and cavity firestopping: UL category XHHW for firestopping materials; category XHKU for forming materials; pursuant to UL Classified systems for openings other than through penetrations.

| UL ASSEMBLIES FOR THROUGH WALL PENETRATIONS |               |        |                       |             |                        |                      |
|---------------------------------------------|---------------|--------|-----------------------|-------------|------------------------|----------------------|
| PENETRANTS                                  |               |        |                       |             |                        |                      |
| WALL TYPE                                   | METAL CONDUIT | CABLES | NON-INSUL. METAL PIPE | INSUL. PIPE | FR POLY PROPYLENE PIPE | INSULATED METAL DUCT |

|                                                                                                                                                   |                        |                        |           |           |           |                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------|-----------|-----------|-----------|--------------------------------------------------|
| GWB Stud Wall or Shaft Wall up to 2-HR Rating                                                                                                     | W-L-1001               | W-L-3001               | W-L-1001  | W-L-5011  | W-L-2002  | W-L-7009 up to 24"x12"<br>W-L-7025 up to 42"x28" |
| CMU Wall up to 2-HR Rating                                                                                                                        | C-AJ-1044<br>C-AJ-1008 | C-AJ-3029<br>C-AJ-3030 | C-AJ-1044 | C-AJ-5001 | C-AJ-2001 | C-AJ-7003<br>C-AJ-7016                           |
| Note: Up to 1-hour rating, submit engineered judgment firestopping system for this combination of penetrant, wall/floor assembly and fire rating. |                        |                        |           |           |           |                                                  |

- E. Performance: F and T rating of not less than 1 hr.; with F rating to match fire resistance rating of assembly or barrier being penetrated.
- F. Design selection: Based on performance and, when compared to other designs that may be suitable, based upon ability to provide environmental/water seal and accommodate:
  - 1. Movement transmitted by the penetration item.
  - 2. Thermal expansion of construction materials.
  - 3. Future modifications to utilities, services, and penetrations.
- G. Fire-rated Caulk manufacturers:
  - 1. Approved intumescent sealant or putty.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
  - 1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-wool-fiber or rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.
  - 4. Collars.
  - 5. Steel sleeves.

### 2.03 FIRESTOPPING OF STUD WALLS

- A. Firestop stud walls at top and bottom of each story.

### 2.04 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- H. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicted below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of non-sag grade for both opening conditions.

## 2.05 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

### 3.03 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.04 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using contrasting color lettering not less than 3 inches high and with minimum 0.375-inch strokes. See specification section 099100 for additional information.
- B. Install labeling required by code. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage".
  - 2. Contractor's name, address and phone number.
  - 3. Designation of applicable testing and inspecting agency, UL system, F-rating, T-rating, and the hourly rate of the wall.
  - 4. Date of installation.
  - 5. Manufacturer's name, and product number.
  - 6. Installer's name.

### 3.05 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

## 3.06 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestopping with No Penetrating Items:
  - 1. UL-Classified Systems: W-L-0001-0999.
  - 2. F-Rating: 1 or 2 hours.
  - 3. T-Rating: 1 hour
  - 4. Type of Fill Materials: As required to achieve rating.
- C. Firestopping for Metallic Pipes, Conduit, or Tubing:
  - 1. UL-Classified Systems: W-L-1001-1999.
  - 2. F-Rating: 1 or 2 hours.
  - 3. T-Rating: 1 hour.
  - 4. Type of Fill Materials: As required to achieve rating.
- D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
  - 1. UL-Classified Systems: W-L-2001-2999.
  - 2. F-Rating: 1 hour to 2 hours.
  - 3. T-Rating: 1 hour.
  - 4. Type of Fill Materials: As required to achieve rating.
- E. Firestopping for Electrical Cable:
  - 1. UL-Classified Systems: W-L-3001-3999.
  - 2. F-Rating: 1 hour or 2 hours.
  - 3. T-Rating: 1 hour.
  - 4. Type of Fill Materials: As required to achieve rating.
- F. Firestopping for Miscellaneous Mechanical Penetrants:
  - 1. UL-Classified Systems: W-L-7001-7999.
  - 2. F-Rating: 1 hour or 2 hours.
  - 3. T-Rating: 1 hour.
  - 4. Type of Fill Materials: As required to achieve rating.
- G. Firestopping for Groupings of Penetrants:
  - 1. UL-Classified Systems: W-L-8001-8999.
  - 2. F-Rating: 1 hour or 2 hours.
  - 3. T-Rating: 1 hour.
  - 4. Type of Fill Materials: As required to achieve rating.

**END OF SECTION 078400**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Provide through penetration firestopping. The work of this section shall include, but not be limited to, the following:
  - 1. Provide firestopping at all openings in floors and fire rated walls and partitions to prevent the passage of fire, smoke or toxic gases and to maintain required fire ratings.
  - 2. Provide firestopping at all electrical, plumbing and electrical duct and pipe penetrations in floors, and fire-rated walls and partitions, to prevent the passage of fire, smoke or toxic gases.

## 1.02 QUALITY ASSURANCE

- A. Qualifications: The work of this section shall be performed by a qualified and experienced installer, acceptable to the Architect/Engineer. The term "installer", as used herein shall mean a firm of established reputation; which has been trained by the manufacturer in the proper installation of fire safing material and which is regularly engaged in, and maintains a regular force of workers skilled in the installation of fire safing material of the type specified.

## 1.03 REFERENCES

- A. Codes and Regulations: Comply with applicable regulations of governmental authorities having jurisdiction.
- B. ASTM E119, Method for Fire Tests of Building Construction and Materials.
- C. ASTM E814, Fire Tests of Through Penetration.
- D. U.L. 1479, Standards for Fire Tests of Through Penetration Firestops.
- E. Factory Mutual Systems.

## 1.04 SUBMITTALS

- A. Shop Drawings: Shop drawings shall indicate the locations and types of the various fire safing material to be used throughout the building, and material and methods of installation of damming for the various floor, wall and ceiling construction. Details of damming shall be large scale and shall indicate material and methods of installation.
- B. Product Data: Submit manufacturer's technical data and installation instructions.
- C. Test Reports: Submit copies of test reports, by an independent testing laboratory, indicating that the fire safing material complies with the specified requirements.

## 1.05 FIELD QUALITY CONTROL

- A. Section 014500 - Quality Control: field inspection and testing.
- B. Tests for thickness and density of applied material will be performed by an independent testing agency. Where test results are unsatisfactory in sample areas, additional tests in other areas may be made. Such further testing, if required, shall be by the same testing agency but shall be paid for by the installer.
- C. Independent Testing Agency will:

1. Inspect the installed firestopping after application and curing for integrity, prior to its concealment.
2. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.
3. Re-inspect the installed firestopping for integrity of fire protection, after installation of subsequent work.
4. Provide written certification to the Architect, indicating installation meets or exceeds requirements of contract documents.

#### 1.06 WARRANTY

- A. Provide standard manufacturer's warranty on material composition and resistance to breakdown.

### PART 2 - PRODUCTS

#### 2.01 FIRE RESISTANT SILICONE FOAM

- A. Acceptable materials are DOW CORNING Silicone RTV Foam, Chase-Foam CTCPR-855 by CHASE TECHNOLOGY CORP., Pensil RTV 851 by GENERAL ELECTRIC, or approved equal.
- B. Foam sealant shall conform to the required fire rating in accordance with the requirements of ASTM E119, with a flamespread rating of 15 in accordance with ASTM E84. Foam sealant shall also conform to UL Standard 1479: "Standards for Fire Tests of Through Penetration Firestops".
- C. The foam sealant shall provide a fire resistance equal to the construction into which it is installed; in accordance with "Through Penetration Firestop Systems (XHEZ)" in the Underwriters Laboratories "Building Materials Directory".
- D. Dams: Provide dams as recommended by the manufacturer, as required for proper installation and for required fire rating.

#### 2.02 MINERAL FIBER FIRE SAFING INSULATION

- A. Provide insulation as manufactured by USG INTERIORS, INC. Product "Thermafiber Safing", CAFCO INDUSTRIES LTD., FIBREX INC. or approved equal. Density shall be 4 pcf with thickness to suit condition.
- B. Provide 20 gauge minimum metal plate where required for fire safing support to comply with fire ratings.
- C. Do not use fibrous safing insulation unless it is in conjunction with a compatible smoke seal as specified herein.

#### 2.03 MINERAL WOOL

- A. Loose mineral wool, rated noncombustible when tested according to ASTM E136, free of asbestos and glass fiber, and suitable for stuffing into metal deck flutes to an in place density of 6 to 12 pcf.

#### 2.04 FIRESTOPPING SEALANT

- A. Provide a silicone firestop sealant classified for both flame and temperature ratings under ASTM E814.



- B. Acceptable materials are USG INTERIORS "Smoke Seal Compound", DOW CORNING "Firestop Sealant", BIO FIRESHIELD "Biotherm", 3M "Fire-Barrier Caulk", GENERAL ELECTRIC "RTV 7403" or approved equal.

#### 2.05 FIRESTOPPING MORTAR

- A. Provide Portland cement/fly ash mortar with an air dried density of 50 to 55 pounds per cu.ft. Mortar shall be classified for both flame and temperature ratings under ASTM E814.
- B. Acceptable materials are BIO FIRESHIELD "Novasit K-10" or approved equal.

#### 2.06 PREFORMED PIPE SEALS

- A. Provide preformed intumescent collars classified for both flame and temperature under ASTM E814.
- B. Acceptable materials are BIO FIRESHIELD "Firestop Collars", 3M "Wrap/Strip FS 195" or approved equal.

#### 2.07 ACCESSORIES

- A. Provide anchorage assemblies complying with U.L. designs and other components and accessories as needed.

### PART 3 - EXECUTION

#### 3.01 DELIVERY AND STORAGE

- A. Deliver material and products in unopened packages and containers, clearly indicating name of manufacturer and U.L. labeling. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage. Protect material from freezing or overheating in accordance with manufacturer's instructions.

#### 3.02 INSPECTION

- A. Examine all surfaces to which the firestopping materials are to be applied, and notify the Architect/Engineer in writing of any conditions detrimental to the proper and expeditious installation of the work. Starting of work within an area shall be construed as acceptance of the conditions of that area.
- B. Thoroughly clean all surfaces to receive firestopping material to eliminate mill scale, dirt, grime, oil, grease, dust, loose rust or paint, and all other foreign material.
- C. Cleaning shall be accomplished just prior to application of firestopping material.

#### 3.03 INSTALLATION (GENERAL)

- A. Material and equipment shall be as approved by the manufacturer. Application procedures shall be in strict accordance with the manufacturer's directions and specifications. Only experienced, skilled mechanics approved by the material manufacturer shall be allowed to place the material.
- B. Provide firestopping material at thicknesses as required to provide indicated ratings. Where not otherwise indicated, comply with U.L. standard designs. In multiple layer work, offset joints by at least 6 inches.

- C. Anchor firestopping using manufacturer's recommended system and in compliance with U.L. standard designs.
- D. Install firestopping without gaps and voids of any kind. Do not use damaged materials. Remove and replace nonfitting or disturbed work.

### 3.04 MINERAL SAFING INSULATION

- A. Use mineral safing insulation at top of fire-rated partitions at underside of metal deck to provide complete fire-rated seal.
- B. Mineral safing insulation must be used in conjunction with a sealant or foam firestop to ensure a continuous smoke seal.

### 3.05 FIRESTOPPING SEALANT

- A. Use firestopping sealant at narrow joints at fire-rated floor and wall penetrations, and at penetrations subject to vibration or movement. Typical penetrations requiring sealant are plumbing and HVAC piping, electric conduit and ductwork.
- B. Where openings are large enough, use mineral safing insulation in thicknesses required to dam the joint, and apply 1/2 inch minimum depth of sealant, or as required to achieve the rated assembly.

### 3.06 FOAM-IN-PLACE FIRESTOPPING

- A. Apply foam-in-place firestopping material in depths required to meet the fire ratings indicated or required by U.L. standards. Provide clips or other approved means to contain the foam-in-place material which will enable the foam to solidly fill the areas intended. Mixing and application shall be in strict accordance with the manufacturer's written instructions.
- B. Foam firestopping may be used in lieu of sealant or mortar material at the Contractor's option, provided details conform to manufacturer's recommendations for maintaining the integrity of the assembly in question.

### 3.07 FIRESTOPPING MORTAR

- A. Mortar may be used to firestop all large, nonmoving openings in fire-rated assemblies, including multiple openings in floor slabs.
- B. Mix mortar with clean water in accordance with the manufacturer's printed instructions. Wet all surfaces with water prior to application of mortar. Apply by hand or pump and vibrate in penetrations to prevent voids from forming.
- C. Do not apply mortar if ambient or substrate temperature is below 35°F during the 24 hour period before application.

### 3.08 PREFORMED PIPE SEALS

- A. Use preformed pipe seals for firestopping nonmetallic pipes or conduit penetrating rated assemblies. Preformed collars may be surface mounted or embedded in firestop mortar as space permits to seal PVC or ABS pipe penetrations. Size selection and installation shall be in strict accordance with manufacturer's written instructions.

**3.09 FIELD QUALITY CONTROL**

- A. Coordinate installation of firestopping work with other work to minimize cutting and removal of installed firestopping. As work of other trades is completed, review firestopping work and repair or replace work which has been damaged or removed. Inspections will be performed to verify compliance with requirements.

**3.10 CLEANING AND PROTECTION**

- A. Upon completion of the work, remove all unused materials from the site. Clean floors, walls and other adjacent surfaces that are stained, marred or otherwise damaged by this work. Leave all work and the adjacent areas in a clean condition.
- B. Protect all completed work from damage, by methods recommended by the manufacturer of installed material.

**3.11 SYSTEMS AND APPLICATION SCHEDULE**

|    |                                 |                    |
|----|---------------------------------|--------------------|
| A. | CONSTRUCTION CONDITION          | UL DESIGNATION     |
| B. | Metal Pipe or Conduit           | 220, 221, 223      |
| 1. | Through Round Opening           | 316, 400, 425      |
| C. | Insulated Metal Pipe            | 301, 310, 402, 403 |
| 1. | Through Round Opening           |                    |
| D. | Metal Pipes or Conduits         | 399                |
| 1. | Through Large Openings          |                    |
| E. | Cables Through Opening          | 222, 224, 307, 425 |
| F. | Nonmetallic (Plastic) Pipe      | 300                |
| 1. | or Conduit through Opening      |                    |
| G. | Metal Pipe or Conduit           | 425                |
| 1. | Through Gypsum Board Wall       |                    |
| H. | Nonmetallic (Plastic) Pipe      | 226, 227, 228, 312 |
| 1. | or Conduit Through Gypsum       |                    |
| 2. | Board Wall                      |                    |
| I. | Cables Through Gypsum           | 425                |
| 1. | Board Wall                      |                    |
| J. | Mixed Penetrating Items         | 218, 219           |
| K. | 1. Ductwork Insulated           | 301                |
|    | 1. Through Gypsum Board Wall in | 227, 313           |
|    | 2. Sleeve Opening               |                    |
| L. | 1. Ductwork                     | 218, 219           |
|    | 1. 2 Hr Gypsum Wall             | 312                |

- 3.12 PROVIDE ADDITIONAL UL DESIGNATION AS REQUIRED TO ACHIEVE FIRESTOPPING RATINGS EQUAL TO OR GREATER THAN ASSEMBLY PENETRATION.

**END OF SECTION 078413**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes joint sealants for the following locations:
  - 1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as follows, unless indicated otherwise:
    - a. Control and expansion joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints between different materials.
    - d. Perimeter joints (both interior and exterior) between materials listed above, frames of doors, windows, and louvers.
    - e. Joints at plumbing, sprinkler, mechanical and electrical penetrations thru the exterior building envelope.
    - f. At any fixed joint or space that allows air penetration into the building.
    - g. Other joints as indicated.
  - 2. Exterior joints in horizontal traffic surfaces as follows below, unless indicated otherwise:
    - a. Control, expansion, and isolation joints in cast-in-place slabs, sidewalks, aprons and pavement.
    - b. Joints between different materials listed above.
    - c. Other joints as indicated.
  - 3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as follows, unless indicated otherwise:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    - d. Control joints in GWB walls and ceilings.
    - e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - f. Perimeter joints of toilet fixtures, urinals, wall hung sinks, mop sinks, drinking fountains, etc.
    - g. Any joints or voids between dissimilar materials.
    - h. Any joints or voids between existing and new construction.
    - i. Other joints as indicated.
  - 4. Interior joints in horizontal traffic surfaces as follows, unless indicated otherwise:
    - a. Control and expansion joints in cast-in-place concrete slabs.
    - b. Other joints as indicated.
- B. This section includes spray foam sealant to be used throughout the project to seal the building envelope penetrations and any break in the building envelope including but not limited to studs, sills, headers, other framing/sheathing gaps, exterior door frames, window frames, louvers, vents, electrical boxes, mail box slots, wall hydrants and at any other exterior penetration creating a gap or break in the envelope insulation.
- C. This section includes sealant for setting beds for exterior window and louver sills and exterior door thresholds.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 033000 - Cast-In-Place Concrete

2. Section 042113 - Brick Masonry
3. Section 042200 - Concrete Unit Masonry
4. Section 047200 - Cast Stone
5. Section 074216 – Metal Soffit Panels
6. Section 076200 – Sheet Metal Flashing and Trim
7. Section 077123 – Gutters and Downspouts
8. Section 078400 – Firestopping
9. Section 081113 – Hollow Metal Doors and Frames
10. Section 085213 - Aluminum Clad Wood Windows.
11. Section 088000 - Glazing for sealants used in glazing.
12. Section 092900 – Gypsum Board.
13. Section 093013 - Ceramic Tiling.

### 1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM C920 "Standard Specification for Elastomeric Joint Sealants".
- C. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- D. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

### 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
  1. Certification by joint sealant manufacturer that sealants, plus the primers and cleaners required for sealant installation, comply with local regulations controlling use of volatile organic compounds.
  2. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
  3. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
  4. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.
  5. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.
- B. Submit pursuant to Section 016100 - Product Requirements.
- C. Samples for verification purposes of each type and color of joint sealant required and selected by the Architect. Install joint sealant samples in ½-inch wide joints formed between two six (6) inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Provide cured sample of each Architect approved color sealant a minimum of thirty (30) days prior to installation.

1. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view. THE SAME COLOR SEALANT WILL NOT BE USED THROUGHOUT THIS PROJECT.
2. Sample of Bond Breaker Tape: 24-inch long section.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who had completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Provide certification from sealant manufacturer signed by a corporate officer attesting that sealant products comply with Contract Documents.
- C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
  1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
  2. When joint substrates are wet due to rain, frost, condensation or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

### PART 2 PRODUCTS

#### 2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
  1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

## 2.02 SPRAY FOAM SEALANT

- A. One component, minimal expanding, low pressure build, flexible polyurethane foam sealant.
  - 1. GREAT STUFF PRO™ Window & Door Foam Sealant by Dow Building Solutions.
  - 2. Energy Complete Sealant by Owens Corning.
  - 3. Architect approved equivalent.

## 2.03 ENTRANCES, STOREFRONTS, WINDOWS, AND FLASHING

- A. Sealant: BASF polyurethane, one-component (MasterSeal® NP1™) or two component (MasterSeal® NP2™) or Architect approved equivalent.
- B. Standard: ASTM C920
  - 1. NP1™: Type S, Grade NS, Class 35.
  - 2. NP2™: Type M, Grade NS, Class 25
- C. Colors:
  - 1. To be selected by Architect from manufacturer's full range of colors.

## 2.04 MASONRY AND OTHER EXTERIOR LOCATIONS (AS SHOWN ON DRAWINGS AND ALL REQUIRED INCIDENTAL APPLICATIONS.)

- A. Sealant: BASF polyurethane, two component (MasterSeal® NP2™) or Architect approved equivalent.
- B. Standard: ASTM C920
  - 1. Type M.
  - 2. Grade NS
  - 3. Class 25
- C. Colors:
  - 1. To be selected by Architect from manufacturer's full range of colors.

## 2.05 INTERIOR CONTROL AND EXPANSION JOINTS

- A. Sealant: BASF polyurethane, one-component (MasterSeal® NP1™) or Architect approved equivalent.
- B. Standard: ASTM C920.
  - 1. Type: S.
  - 2. Grade: NS.
  - 3. Class: 35.
- C. Colors:
  - 1. To be selected by Architect from manufacturer's standard colors.

## 2.06 CONCRETE CONTROL AND EXPANSION JOINTS (INTERIOR AND EXTERIOR)

- A. BASF Multi-Component Self-Leveling Elastomeric Polyurethane Sealant: (MasterSeal® SL2™) or Architect approved equivalent.
- B. Standard: ASTM C920, Type M, Class 25, Grade P.
- C. Color: Match concrete color.



- D. Use slope grade where conditions warrant.

#### 2.07 INTERIOR MATERIAL AND NON-MOVING JOINTS

- A. Sealant: siliconized acrylic - latex, non-sag one component.
- B. Standard: ASTM C834-95.
  - 1. Modulus @ 100% 15-20 psi
  - 2. Ultimate tensile 30-40 psi.
  - 3. Ultimate elongation 400%-500%
- C. Colors:
  - 1. To be selected by Architect from manufacturer's full range of colors.

#### 2.08 INTERIOR MILDEW RESISTANT JOINTS

- A. Sealant: silicone, one component, fungicidal.
- B. Standard: ASTM C920
  - 1. Type: S.
  - 2. Grade: NS.
  - 3. Class: 25.
- C. Colors:
  - 1. To be selected by Architect from manufacturer's full range of colors.

#### 2.09 SETTING BEDS FOR EXTERIOR WINDOW AND LOUVER SILLS AND EXTERIOR DOOR THRESHOLDS

- A. Sealant: Butyl Rubber and/or Polyisobutylene Mastic Sealant (Tremco® Butyl Sealant or Architect Approved Equivalent).
- B. Standard: ASTM C1311.
- C. Color: Black unless any is exposed to view.

#### 2.10 ACCESSORY COMPONENTS

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint

surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.11 MISCELLANEOUS MATERIALS

- A. Primer: Provide sealant manufacturer's primer formulated for each sealant over each substrate surface. Omit only where specifically approved by sealant manufacturer for a specific sealant application over a specific substrate surface.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 EXECUTION

### 3.01 EXAMINATION AND PREPARATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.
- B. Clean substrate surfaces around joint free of moisture, oil, dust, release agents, and materials harmful to sealant adhesion and cure.
  - 1. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 2. Remove laitance and form release agents from concrete.
  - 3. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm surfaces, or leave residues capable of interfering with adhesion of joint sealants.
- C. Execute joint preparation pursuant to sealant manufacturer's published instructions.
  - 1. Joint Priming: Prime joint substrates where indicated and where recommended by joint sealant manufacturer based on Preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
  - 2. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.02 JOINT SUB-ASSEMBLY

- A. Backer rod:
  - 1. Select size to result in a tight fit without excessive deformation to rod.
  - 2. Place continuously in joint by means of a roller or other tool approved by sealant manufacturer. Do not stretch rod.
  - 3. Replace rod that is damaged, ruptured, or torn.

4. Place at a uniform depth pursuant to sealant manufacturer's published instructions.
- B. Bond breaker tape:
  1. Place continuously and to full dimension between sealant bond surfaces.
  2. Locate and install pursuant to sealant manufacturer's published instructions.

### 3.03 PRIMER APPLICATION

- A. Apply in a continuous, even application pursuant to sealant manufacturer's published instructions.

### 3.04 SEALANT APPLICATION

- A. Apply in an even, continuous application.
- B. Avoid 3-sided joints. Use backer rod or bond breaker tape to create 2-sided joints pursuant to sealant manufacturer's published instructions.
- C. Avoid vee shaped joints. Use backer rod to bring width of joint back closer to width of joint front.
- D. Apply to achieve a solid bond to both joint bond surfaces. Tool sealant surface concave.
- E. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

### 3.05 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that repaired areas are indistinguishable from original work.

### END OF SECTION 079200

## PART 1 – GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section describes piping and ductwork sleeves and seals required where piping and ductwork passes through non fire rated floor slabs, interior walls, and exterior wall applications.

## 1.02 RELATED WORK

- A. Pipe, Valves, and Fittings - Section 232000
- B. Through Penetration Firestopping – Section 078413

## 1.03 1.03 – QUALITY ASSURANCE

- A. Modular Seal components and systems shall be domestically manufactured at a plant with a current ISO-9001:2000 registration. Copy of ISO-9001:2000 registrations shall be a submittal item.

## 1.04 SUBMITTALS

- A. Submit manufacturer's data sheets on all products. Data sheets shall include dimensions, material, temperature rating, and installation instructions.

## PART 2 – PRODUCTS

## 2.01 INTERIOR WALL PIPE PENETRATIONS

- A. For Concrete or Masonry Interior Walls:
  - 1. Split Wall Acoustical Seals consist of two bolted pipe halves with minimum 3/4" thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240 degrees F, 10# density fiberglass may be used in lieu of the sponge. Seals shall be type SWS as manufactured by Mason Industries, Inc.
  - 2. Spool Type Acoustical Pipe Seals shall consist of a closed cell neoprene sponge interior surrounded by a welded steel sleeve and flange. Concrete shall be packed around the seal to make it integral with the surface if the seal is not already in place around the pipe prior to the construction of the building member. Caulk any residual cracks. Seals shall be type SPS as manufactured by Mason Industries Inc.
  - 3. Provide a minimum 10 gauge pipe
- B. For gypsum board walls:
  - 1. Box in round sleeve openings for pipe with No. 20 gauge galvanized sheet metal.
  - 2. Flange out edges of sheet metal a minimum of 1 ½ inches to secure sleeve to wall.
  - 3. Pack annular space between pipe and sleeve completely with mineral fiber. Recess fibrous material into sleeve 0.5 inches.
  - 4. Caulk openings from wall surface to pipe with nonhardening acoustical sealant both sides of wall.
  - 5. Seal metal sleeve to gypsum board wall.

## 2.02 INTERIOR WALL DUCT SLEEVES AND SEALS

- A. Box in rectangular or round sleeve openings for ductwork with No. 20 gauge galvanized sheet metal. Metal sleeve to be 0.5 to 0.75 inches larger than outside dimensions of duct.
- B. Flange out edges of sheet metal a minimum of 1 ½ inches to secure sleeve to wall.
- C. Pack annular space between ductwork and sleeve completely with mineral fiber. Recess fibrous material into sleeve 0.5 inches.
- D. Caulk openings from wall surface to duct with nonhardening acoustical sealant both sides of wall.
- E. Grout metal sleeve into concrete or cmu wall or seal metal sleeve to gypsum board wall.

## 2.03 EXTERIOR WALL AND FLOOR PENETRATIONS

- A. Furnish and install a complete Link-Seal modular seal assembly, manufactured by PSI-Thunderline/Link-Seal. For clarification, complete assembly is defined as a combined:
  - 1. Wall opening (i.e. steel sleeve, Thermoplastic (HDPE) sleeve, cored hole or formed hole). The wall opening size and/or type shall be selected according to recommendations found in the most recent Link-Seal modular seal catalog.
  - 2. Sufficient quantity and type of Link-Seal modular seals required to effectively provide a hydrostatic and/or fire-rated seal.
  - 3. Each individual link shall be conspicuously and permanently identified with the name of the manufacturer and model number.
- B. Modular Seal Rubber Links: Shall be modular, mechanical type, consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening. The elastomeric element shall be sized and selected per manufacturer's recommendations and have the following properties as designated by ASTM. Coloration shall be throughout elastomer for positive field inspection. Each link shall have a permanent identification of the size and manufacturer's name molded into it.
  - 1. For Standard Service Applications = Model C -40 to +250°F (-40 to +121°C) EPDM = ATSM D2000 M3 BA510 Color = Black
  - 2. For Thin Walled Pipe Applications = Model L -40 to +250°F (-40 to +121°C) EPDM = ATSM D2000 M3 BA510 Color = Blue
  - 3. For Hydrocarbon Service Applications = Model O -40 to +210°F (-40 to +99°C) Nitrile = ASTM D2000 M1BF510 Color = Green
  - 4. For High Temperature or Fire Seal Applications = Model T -67 to +400°F (-55 to +204°C) Silicone = ASTM D2000 M1GE505 Color = Gray Reference shall always be made to the latest published Link-Seal modular seal selection guide for the service intended.
- C. Pressure Plates:
  - 1. Link-Seal modular seal pressure plates shall be molded of glass reinforced Nylon Polymer with the following properties:
    - a. Izod Impact - Notched = 2.05ft-lb/in. per ASTM D-256
    - b. Flexural Strength @ Yield = 30,750 psi per ASTM D-790
    - c. Flexural Modulus = 1,124,000 psi per ASTM D-790
    - d. Elongation Break = 11.07% per ASTM D-638
    - e. Specific Gravity = 1.38 per ASTM D-792
  - 2. Models LS200-275-300-315 shall incorporate the most current Link-Seal Modular Seal design modifications and shall include an integrally molded compression assist boss on the top (bolt entry side) of the pressure plate, which permits increased compressive loading of the rubber sealing element. Models

315-325-340-360-400-410-425-475-500-525-575-600 shall incorporate an integral recess known as a "Hex Nut Interlock" designed to accommodate commercially available fasteners to insure proper thread engagement for the class and service of metal hardware. All pressure plates shall have a permanent identification of the manufacturer's name molded into it.

3. For fire and Hi-Temp service, pressure plates shall be steel with 2-part Zinc Dichromate Coating.
- D. Seal Hardware: All fasteners shall be sized according to latest Link-Seal modular seal technical data. Bolts, flange hex nuts shall be either:
  1. Mild Steel with a 60,000 psi minimum tensile strength and 2-part Zinc Dichromate coating per ASTM B-633 and Organic Coating, tested in accordance with ASTM B-117 to pass a 1,470 hour salt spray test.
  2. 316 Stainless Steel per ASTM F593-95, with a 85,000 psi average tensile strength.
- E. Wall Opening:
  1. Century-Line Sleeves - for openings to 24.81" diameter. Where pipes must pass through exterior walls of new structures, unless otherwise shown or specified, install molded non-metallic high density polyethylene Model CS Century-Line sleeves as manufactured by PSI-Thunderline/Link-Seal. Model CS sleeves shall have integrally formed hollow water stop sized having a minimum of four inches larger than the outside diameter of the sleeve itself and allowing 1/2" movement between wall forms to resist pour forces. Each sleeve assembly shall have end caps manufactured of the same material as the sleeve itself and installed at each end of the sleeve so as to prevent deformation during the initial concrete pour, and to facilitate attaching the sleeve to the wall forms. End caps shall remain in place to protect the opening from residual debris and rodent entry prior to pipe insertion.
  2. Cell-Cast Disks - for openings from 29.25" to 64.74" diameter. The contractor shall install Cell-Cast disks, providing a round hole in conformance with Link-Seal modular seal sizing data. Cell-Cast disks shall consist of 3" and/or 4" lightweight interlocking polyethylene cells stacked to form the thickness of the poured concrete wall. Molded into each cell shall be a cavity to accept a 2" x 4" nailer.

#### 2.04 ACOUSTICAL SEALANTS

- A. Acoustical sealants shall be non-hardening type.
- B. Acoustical sealants shall be one of the following products:
  1. Acoustical Sealant – Tremco
  2. Approved Equal

### PART 3 – EXECUTION

#### 3.01 GENERAL

- A. In general the contractor shall provide sleeves at all penetrations.
- B. After installation of the sleeve, completely seal around sleeve to the wall or floor material.
- C. Install pipe sleeves and seals as per the manufacturers instructions.
- D. Pipe sleeves shall not support weight of the pipe. Provide pipe supports on both sides of the seal.
- E. Provide escutcheon plates for all exposed penetrations.

#### END OF SECTION 079201



## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

## 1.02 SECTION INCLUDES

- A. This Section references specification sections relating to commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical and access control door hardware.
  - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
  - 4. Cylinders specified for doors in other sections.

## 1.03 RELATED REQUIREMENTS

- A. Section 013100 - PROJECT MANAGEMENT AND COORDINATION: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- B. Section 017800 - CLOSEOUT SUBMITTALS: Project record documents, operation and maintenance (O&M) data, warranties and bonds.
- C. Section 087100 - DOOR HARDWARE.

## 1.04 CODES AND REFERENCES

- A. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ICC A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC (IBC) - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- B. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.
  - 1. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
  - 2. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
  - 3. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2019.
  - 4. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
  - 5. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.



## 1.05 SUBMITTALS

- A. See Section 013100 - PROJECT MANAGEMENT AND COORDINATION and 013300 - SUBMITTALS, for submittal procedures.
- B. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- E. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- G. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

## 1.06 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ICC A117.1 requirements and guidelines as directed in the applicable model building code.
- F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## 1.08 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.09 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

## 1.10 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## 1.11 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

## PART 2 PRODUCTS

## 2.01 SCHEDULED DOOR HARDWARE

- A. Refer to PART 2 OF SECTION 087100- DOOR HARDWARE (PHASE II FIREHOUSE)

## PART 3 EXECUTION

## 3.01 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.
  - 1. Section 087100 - DOOR HARDWARE
- D. Manufacturer's Abbreviations:
  - 1. MK - McKinney
  - 2. PE - Pemko
  - 3. RF - Rixson
  - 4. RO - Rockwood
  - 5. AD - Adams Rite
  - 6. SA - Sargent
  - 7. AT - Accurate Lock and Hardware

8. SU - Securitron

9. NO - Norton

**HARDWARE SCHEDULE (PHASE 1 STORAGE BUILDING)****Set No. 1 (Doors 101, 104, and 109)**

|   |                             |                                            |       |    |
|---|-----------------------------|--------------------------------------------|-------|----|
| 1 | Continuous Hinge            | CLFM__HD1                                  | US26D | MK |
| 1 | Kickplate                   | K1050 10" high CSK BEV                     | US32D | RO |
| 1 | Rim Exit Device             | 55 8876-12v ETP                            | US32D | SA |
| 1 | Permanent Core              | Compatible with Facility's Existing System |       |    |
| 1 | Electronic Strike           | by Security System Supplier                |       |    |
| 1 | ElectroLynx Harness - Frame | by Security System Supplier                |       |    |
| 1 | ElectroLynx Harness - Door  | by Security System Supplier                |       |    |
| 1 | Electric Power Transfer     | by Security System Supplier                |       |    |
| 1 | Wiring Diagram              | by Security System Supplier                |       |    |
| 1 | Position Switch             | by Security System Supplier                |       |    |
| 1 | Card Reader                 | by Security System Supplier                |       |    |
| 1 | Power Supply                | by Security System Supplier                |       |    |
| 1 | Threshold                   | see architectural detail                   | Alum. | PE |
| 1 | Concealed Overhead Stop     | 1-336                                      | 630   | RF |
| 1 | Door Closer                 | CLP7500                                    | 689   | NO |
| 2 | Silencer                    | 608                                        |       | RO |
| 1 | Card Reader                 | by Security System Supplier                |       |    |
| 1 | Sweep                       | 18061CNB                                   |       | PE |
| 3 | Weatherstripping            | S773BL (3 Sides)                           |       | PE |

**Set No. 2 (Doors 102, 103, 105, and 106)**

|   |                             |                                            |       |    |
|---|-----------------------------|--------------------------------------------|-------|----|
| 2 | Hinge                       | TA2714                                     | US26D | MK |
| 1 | Hinge                       | TA2714 QC12                                | US26D | MK |
| 1 | Storeroom Lock              | 72 8204 PL                                 | US32D | SA |
| 1 | Electric Strike             | by Security System Supplier                |       |    |
| 1 | ElectroLynx Harness - Frame | by Security System Supplier                |       |    |
| 1 | ElectroLynx Harness - Door  | by Security System Supplier                |       |    |
| 1 | Electric Power Transfer     | by Security System Supplier                |       |    |
| 1 | Wiring Diagram              | by Security System Supplier                |       |    |
| 1 | Position Switch             | by Security System Supplier                |       |    |
| 1 | Card Reader                 | by Security System Supplier                |       |    |
| 1 | Power Supply                | by Security System Supplier                |       |    |
| 1 | Permanent Core              | Compatible with Facility's Existing System |       |    |
| 1 | Door Closer                 | CLP7500                                    | 689   | NO |
| 1 | Concealed overhead stop     | 1-336                                      | 630   | RF |
| 2 | Silencer                    | 608                                        |       | RO |
| 1 | Card Reader                 | BY OWNER                                   |       |    |

|   |           |                        |       |    |
|---|-----------|------------------------|-------|----|
| 1 | FOB       | BY OWNER               |       | SA |
| 2 | Kickplate | K1050 10" High CSK BEV | US32D | RO |

**Set No. 3 (Door 107)**

|   |                             |                                            |       |    |
|---|-----------------------------|--------------------------------------------|-------|----|
| 2 | Hinge                       | TA2714                                     | US26D | MK |
| 1 | Hinge                       | TA2714 QC12                                | US26D | MK |
| 1 | Office Lock                 | 72- V20- 8204 PL                           | US32D | SA |
| 1 | Electric Strike             | by Security System Supplier                |       |    |
| 1 | ElectroLynx Harness - Frame | by Security System Supplier                |       |    |
| 1 | ElectroLynx Harness - Door  | by Security System Supplier                |       |    |
| 1 | Electric Power Transfer     | by Security System Supplier                |       |    |
| 1 | Wiring Diagram              | by Security System Supplier                |       |    |
| 1 | Position Switch             | by Security System Supplier                |       |    |
| 1 | Card Reader                 | by Security System Supplier                |       |    |
| 1 | Power Supply                | by Security System Supplier                |       |    |
| 1 | Permanent Core              | Compatible with Facility's Existing System |       |    |
| 1 | Door Closer                 | CLP7500                                    |       | NO |
| 1 | Concealed overhead stop     | 1-336                                      |       | RF |
| 2 | Silencer                    | 608                                        |       | RO |
| 1 | Card Reader                 | BY OWNER                                   |       |    |
| 1 | FOB                         | BY OWNER                                   |       |    |
| 2 | Kickplate                   | K1050 10" High CSK BEV                     | US32D | RO |

**Set No. 4 (Door 108)**

|   |                |                                            |       |    |
|---|----------------|--------------------------------------------|-------|----|
| 3 | Hinge          | TA2714                                     | US26D | MK |
| 1 | Privacy lock   | 72 8465 L                                  | US32D | SA |
| 1 | Door Closer    | 7500                                       | 689   | NO |
| 1 | Permanent Core | Compatible with Facility's Existing System |       |    |
| 1 | Door Stop      | 441CU                                      | US26D | RO |
| 1 | Silencer       | 608                                        |       | RO |
| 2 | Kickplate      | K1050 10" High CSK BEV                     | US32D | RO |

**END OF SECTION 080671**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following products manufactured in accordance with Steel Door Institute (SDI) Recommended Standards:
  - 1. Doors: Flush, hollow or composite construction standard steel doors for interior and exterior locations.
  - 2. Frames: Pressed steel frames for doors, transoms, sidelights, mullions, interior glazed panels, and other interior and exterior openings of the following type:
    - a. Welded unit type.
    - b. Thermally broken, welded type at all exterior locations.
    - c. Kerfed Frames at interior locations where indicated on Contract Drawings.
  - 3. Assemblies: Provide standard steel door and frame assemblies as required for the following:
    - a. Labeled and fire-rated.
    - b. Thermal rated (insulated).
  - 4. Provide factory primed doors and frames to be field painted.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 081429 - Pre-finished Wood Doors.
  - 2. Section 087100 - Door Hardware.
  - 3. Section 088000 - Glazing.
  - 4. Section 099100 - Painting.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ANSI/SDI A250.8 "Specifications for Standard Steel Doors and Frames".
- C. ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames".
- D. ANSI/SDI A250.6 "Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames".
- E. NFPA 80 "Standard for Fire Doors and Opening Protectives".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016100 - Product Requirements.
- C. Shop drawings showing dimensions, materials, adjacent wall construction, accessories and all other information needed for a complete system.
  - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on the Contract Drawings.
  - 2. Indicate coordination of glazing frames and stops with glass and glazing requirements.

- D. Label Construction Certification: For door assemblies required to be fire-rated and exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

#### 1.05 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Specifications Standard Steel Doors and Frames" ANSI/SDI A250.8 (SDI-100) latest edition and as herein specified.
- B. Membership in good standing in the Steel Door Institute is required. Architect reserves the right to require proof of membership prior to accepting any items described by or related to this Section.
- C. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined per ASTM E 152 and which are labeled and listed by UL, Factory Mutual, Warnock Hersey, or other testing and inspecting organization acceptable to authorities having jurisdiction.
- D. Hot-Rolled Steel Sheets and Strips: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M), free of scale, pitting, or surface defects.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Deliver, handle, and store doors, and frames at job site in such a manner as to prevent damage.
- C. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- D. Protect against moisture exposure and damage. Store doors and frames at building site under cover.
- E. Store doors, and frames in a vertical position on blocking, clear of floor and with blocking between doors to permit air circulation between doors.
- F. Carefully protect frames from twisting or racking and preserve the integrity of spreader bars.
- G. Immediately remove from job site all damaged or otherwise unsuitable door, and frame.

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Establish Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating hollow metal frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

#### 1.08 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts,

anchor bolts and items with integral anchors. Deliver such items to Project site in time for installation.

#### 1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

### PART 2 PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the Work, but are not limited to, the following:
  - 1. Amweld Building Products, LLC
  - 2. Ceco Door Products; an ASSA ABLOY Group Company
  - 3. Curries Company; an ASSA ABLOY Group Company
  - 4. Fleming Door Products Ltd; an ASSA ABLOY Group Company
  - 5. Republic Doors & Frames, an Allegion PLC Company
  - 6. Steelcraft; an Allegion PLC Company

#### 2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating, mill phosphatized.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011 M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: Comply with requirements for grout in Division 03 Section "Grout".
- H. Glazing: Furnished and installed by Division 08 Section "Glazing".

#### 2.03 FINISH

- A. All Steel Doors and Frames shall be factory prepped.
  - 1. Galvanize pursuant to ASTM A653, Grade A60 or G60; to ASTM A591, Class A.



2. Clean, phosphate treat, and paint with a rust inhibitive primer pursuant to ANSI A224.1, applied after fabrication.
3. Reinforcements for galvanized frames are to be galvanized.

#### 2.04 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI-100 requirements.

#### 2.05 HARDWARE

- A. Factory prepare all doors, and frames for hardware pursuant to ANSI A115; ANSI A151; SDI 107; and SDI 111-E. See Door Schedule and Section 087100 - Door Hardware.
- B. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specification for door and frame preparation for hardware.
- C. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.
- D. Coordinate locations of conduits and wiring boxes for electrical connections with Electrical Contractor and Owner's Access Control Contractor.

#### 2.06 INSULATED DOORS:

- A. Grade I, Standard Duty, 1-3/4 in. thick.
- B. Full flush-composite.
- C. Exterior Door Core: Polyurethane with a U-Factor = 0.09, R-Factor = 11.1.
- D. Interior Door Core: Polystyrene.
- E. Door Edge Construction: Seamless Edge, epoxy filled and finished.
- F. Metal thickness: 18 gauge
  1. Construction, and galvanized finish: Pursuant to SDI - 100.
- G. Lites/Glazing stops
  1. Fabricate and install pursuant to SDI - 100.
  2. Material: 20-gauge steel.
  3. Corner construction: Mitered.
  4. Fastening to door: Non-removable steel stops on the outside of exterior door, screws interior of door.
- H. Doors between "living side" and apparatus bay(s) shall be provided with high frequency hinge reinforcement on the top hinge.
  1. 10 gage auxiliary hinge reinforcement spot welded to the top and bottom of the top hinge reinforcement in two locations of the door.
- I. Top and Bottom Edges: Closed with inverted 14-gauge welded channels.

1. Top edges closed with 24 gauge galvanized top caps. Seal top caps in field with caulk prior to painting.
2. Bottom channels of all insulated doors to be provided with concealed double sealing sweeps equivalent to Steelcraft FAS-SEAL™.

#### 2.07 INTERIOR DOORS:

- A. Grade: I, Standard Duty, 1-3/4 in. thick.
  1. Class/rating per drawings - UL approved
- B. Full flush-hollow steel.
- C. Core: Mineral fiberboard.
- D. Door Edge Construction: Seamless Edge, No visible edge seam.
- E. Metal thickness: 18 gauge
  1. Construction, and galvanized finish: Pursuant to SDI - 100.
- F. Lites/Glazing stops
  1. Fabricate and install pursuant to SDI - 100.
  2. Material: 20-gauge steel.
  3. Corner construction: Mitered.
  4. Fastening to door: Screws.
- G. Top and Bottom Edges: Closed with inverted 14-gauge welded channels.
  1. Bottom channels of all rated and smoke tight doors to be provided with concealed double sealing sweeps equivalent to Steelcraft FAS-SEAL™.
- H. Louvers
  1. 1" Thick
  2. Inverted "Y" blade type
  3. Free air space to be 50% of louver area.
  4. Provide fusible link, fire rated louvers in rated doors with louvers.
- I. Doors for fire rated openings:
  1. Provide labeled doors with fire rating per door schedule.

#### 2.08 FRAMES

- A. Provide frames in following types:
  1. Height: 84" frame with 2" head for all stud openings.
  2. Height: 84" frame with 4" head for all masonry openings unless noted otherwise.
  3. Welded construction at all locations.
  4. All exterior door frames shall be thermally broken.
  5. Interior doorframes where indicated on Door Schedule to have integral 1/8" kerf for weatherstripping.
  6. Frames for doors with electric strikes shall have 4 7/8" strike reinforcement with mud box containing an electrical knock out.
  7. Frames for doors scheduled to have door closers, provide full closer sleeve reinforcement.
  8. High Frequency Hinge Reinforcement: Door frames between "Living Side" and apparatus bay(s) shall be provided with high frequency hinge reinforcements at top hinge locations.
  9. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

10. Provide either factory or distributor installed frame back coating (waterborne asphaltic emulsion coating) or field applied primer as indicated in paragraphs 3.01 B 2. and 3.01 B 3 of this section.
- B. Frames for fire rated openings:
  1. Provide frames with same hourly rating as door opening.
- C. Exterior opening metal thickness:
  1. Grade I: 16 gauge.
- D. Interior opening metal thickness:
  1. Grade I: 16 gauge.

#### 2.09 FIRE RATED OPENING ASSEMBLIES

- A. Provide labels on rated doors and frames.
  1. Approved testing agencies for source of labels: Underwriters Laboratories and Factory Mutual.

#### 2.10 SOUND RATED OPENING ASSEMBLIES

- A. Provide steel door and frame assemblies:
  1. STC rating of 52 or better.
  2. 3/4 hr fire rating.

#### 2.11 ACCESSORIES

- A. Grout Guards
  1. Formed from same material as frames, not less than 0.016 inch thick.
  2. Weld guards to frame at back of hardware mortises in frames to be grouted.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install standard steel doors, frames, and accessories in accordance with final approved shop drawings, manufacturer's data, and as herein specified.
- B. Frame Back Painting:
  1. If factory or distributor back coating is furnished touch-up areas of the frame with back coating to cover any bare or primer metal on the inside of the frame. If not factory or distributor back coated, comply with paragraphs 2 and 3.
  2. All metal doorframes to be installed in masonry and exterior walls shall have all hidden surfaces field painted with an additional coat of primer prior to installation. See Section 099100 - Painting.
  3. All metal door frames to be installed in interior non-masonry walls shall have all hidden surfaces field painted with an additional coat of primer from floor level to 48-inches above finish floor prior to installation. See Section 099100 - Painting.
- C. Placing Frames: Comply with provisions of SDI-119 and SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
  1. Erect frames plumb, level, and square; free of racking, warping, or bowing; for effort-free door operation and without gravity-imposed movement upon door anywhere within door swing.
  2. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After

wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged. If screws and/or expansion anchors are required, frames shall be dimpled, and countersunk fasteners utilized.

3. In masonry construction, locate three (3) wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry Tee anchors.
  4. In metal stud partitions, install at least three (3) wall anchors per jamb at hinge and strike levels. Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions. In closed steel stud partitions, attach wall anchors to studs with screws.
  5. Install fire-rated frames in accordance with NFPA Standard No. 80.
- D. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.
1. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

### 3.02 ADJUST AND CLEAN

- A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer, providing for a continuous unbroken primer coating.
- B. Cover countersunk exposed screw heads with epoxy metal filler. Finish smooth and level with frame.
- C. Finish Paint per Section 099100 - Painting.
- D. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
- E. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete proper operating condition. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door. Shims shall not be visible.

**END OF SECTION 081113**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. Extent and location of each type of flush wood door is indicated on Construction Documents and in schedules.
- B. Types of doors required include the following:
  - 1. Solid core flush wood doors with wood veneer faces.
  - 2. Fire-rated flush wood doors.
  - 3. Stile and Rail Doors
- C. Factory-finishing of flush wood doors is included in this Section.
- D. Factory pre-fitting to frames and factory pre-machining for hardware for wood doors is included in this Section.
- E. Louvers for flush wood doors, including furnishing and installation, are specified under this Section.
- F. Metal door frames for flush wood doors are specified in another Division 08 Section.
- G. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 081113 - Hollow Metal Doors and Frames
  - 2. Section 087100 - Door Hardware
  - 3. Section 088000 - Glazing
  - 4. Section 099100 - Painting

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
- C. AWI Quality Standard: "Architectural Woodwork Quality Standards"; including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.
- D. NFPA 80 "Standard for Fire Doors and Windows".

## 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data
  - 1. For each type of door, include grade of door information, core and edge construction, louver information and trim for openings.

2. Fire rated doors showing conformance with NFPA 80.
- D. Shop Drawings
  1. Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, undercuts, requirements for factory finishing, requirements for veneer matching and other pertinent data.
  2. For factory pre-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
- E. Samples
  1. Factory finishes applied to actual door veneer materials, approximately 8" x 10". Provide two (2) samples of each available stain.
  2. Glazing stops: 6" long sample for each available glazing stop.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain-of-custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program..
- B. Forest Certification: Provide doors made with all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".Delete if project is not a LEED project.
- C. Provide wood doors complying with:
  1. ANSI/WDMA: Industry Standard I.S.1-A-11 Series.
  2. Match between Veneer Leaves: Book Match.
  3. Double doors and sliding doors shall be pair matched.
  4. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
  5. Fire-Rated Doors: In addition to complying with I.S.1 Series standards, provide flush wood doors identical in materials and construction to units tested in frame and door assemblies pursuant ASTM E 152 and which are labeled and listed for ratings indicated by Underwriters Laboratories, Factory Mutual, or other testing and inspection agency acceptable to authorities having jurisdiction.
- D. Obtain doors from a single manufacturer, unless otherwise indicated.
  1. Mark each door with stamp indicating conformance with WDMA Wood Flush Door Certification Hallmark.
  2. Mark each door manufactured with Type I (exterior) adhesives with permanent Type I glue bond mark.
- E. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this section.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Package, deliver, store, and handle doors pursuant to WDMA standards and appendix plus manufacturer's recommendations.
- D. Mark each door on top and bottom rail with opening number used on Shop Drawings.

## 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC System is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

## 1.08 WARRANTY

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
  - 1. Warranty shall include reinstallation that may be repaired due to repair or replacement of defective doors where defect was not apparent prior to hanging.
  - 2. Warranty shall be in effect during following period of time after date of Substantial Completion.
  - 3. Solid Core Interior Doors:
    - a. Life of installation
- C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors which may be incorporated in the Work include, but are not limited to, the following:
  - 1. Solid Core Doors with Wood Veneer Faces, Stile and Rail Doors, and Fire Rated Flush Wood Doors.
    - a. Algoma Hardwoods, Inc.: Architectural Series
    - b. Marshfield Door System: Signature Series
    - c. Graham: GPD Series
    - d. VT Industries: Artistry Series

## 2.02 FLUSH WOOD DOORS, GENERAL

- A. Fabricate doors pursuant to WDMA Industry Standard I.S.1 Series.
- B. WDMA I.S. 1A Performance Grade: Heavy Duty

## 2.03 INTERIOR DOORS - SOLID CORE - 1 3/4" THICK UNO

- A. Face:
  - 1. Species: maple, plain sliced, natural, select white veneer, Premium AA Grade.
  - 2. Factory finished: transparent manufacturer's standard stain color selection by Architect.
    - a. Minimum of eight standard stain colors are required.
- B. Structural Composite Lumber Core (SCLC)
  - 1. Structural Composite Lumber: Engineered hardwood composite wood products tested in accordance with WDMA I.S.1A, Testing Cellulosic Composite Materials for

2. tested in accordance with WDMA I.S.1A, Testing Cellulosic Composite Materials for use in Fenestration Products containing no added Urea Formaldehyde.
- C. Hardware Preparation:
1. Factory machine doors for hardware that is not surface applied. Comply with final, approved hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
  2. Electrical Raceways: Provide wood doors receiving electrified hardware with concealed pathway for wiring harness with plug connectors on both ends. Coordinate with hardware supplier if wiring harness is to be factory installed in wood door.
- D. Edge Bands:
1. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA Section P-1, Performance Standards for Architectural Wood Flush Doors.
  2. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA Section P-1, Performance Standards for Architectural Wood Flush Doors.
- E. Doors for fire rated openings:
1. Provide construction and core as needed to provide fire ratings indicated.
  2. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60 and 90 minute rated doors. Comply with specified requirements for exposed edges.
  3. Category B Edge Construction: Provide 20 minute fire rated doors at Category B, with smoke and fire seals applied to frame for 20 minute openings.
  4. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    - a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.
    - b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel in color as selected by the Architect.
- F. Glued on Applique
1. Provide glued on wood molding to simulate a six-panel ( 2x3 or 3x2) door, as detailed.
- G. Finishes
1. Doors shall receive factory finishing.
  2. Factory Finishing: WDMA System TR-6, catalyzed polyurethane, premium grade.
    - a. Stain Coat
    - b. Sealer: 3 coats
    - c. Sanding: Sand
    - d. Topcoat: 2 coats

#### 2.04 STILE AND RAIL DOORS

- A. Face:
1. Species: maple, plain sliced, natural, select white veneer, Premium AA Grade.
  2. Factory finished: transparent manufacturer's standard stain color selection by Architect.
    - a. Minimum of eight standard stain colors are required.
- B. Stiles, Rails, Mullions, and Cross Rails: Shall be solid core construction using wood species as noted above. Joints to be tongue and grooved, dowleed, and glued under pressure with Type I waterproof glue.



- C. Panels:
  - 1. Solid core with perimeter shaped to proper contour, with panels to match drawings. Panel edge concealed after assembly by solid lumber sticking bead. Panel edges shall be machined to produce raised panel profile.
- D. Doors for fire rated openings:
  - 1. Provide construction and core as needed to provide fire ratings indicated.
  - 2. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60 and 90 minute rated doors. Comply with specified requirements for exposed edges.
  - 3. Category B Edge Construction: Provide 20 minute fire rated doors at Category B, with smoke and fire seals applied to frame for 20 minute openings.
  - 4. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    - a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.
    - b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel in color as selected by the Architect.
- E. Finishes
  - 1. Doors shall receive factory finishing.
  - 2. Factory Finishing: WDMA System TR-6, catalyzed polyurethane, premium grade.
    - a. Stain Coat
    - b. Sealer: 3 coats
    - c. Sanding: Sand
    - d. Topcoat: 2 coats

## 2.05

- A. Same grade and finish as interior doors. Hardware and edge bands same as interior doors.
- B. Every door shall have a hollow metal door frame unless otherwise noted.

## 2.06 LOUVERS AND LIGHT FRAMES

- A. Metal Louvers: Size, type and profile shown on the Contract Drawings and fabricated from the following:
  - 1. Steel: 20-gage, galvanized and factory primed for paint finish.
    - a. Color: To be selected by Architect from the manufacturer's full range of colors.
  - 2. Provide fusible link, self-closing louvers in fire rated doors.
- B. Metal Frames for Lite Openings in Fire Rated Doors: Manufacturer's standard frame formed of 18-gage cold-rolled steel, factory-primed, and approved for use in door of fire-rating indicated.
- C. Wood Frames for Lite Openings in Non-Rated Doors: Manufacturer's standard wood frame in same species as door faces, factory stained to match face of doors.

## PART 3 EXECUTION

### 3.01 EXAMINATION AND INSTALLATION

- A. Inspect openings to verify that frames are plumb and level and comply with tolerance requirements of WDMA Industry Standard I.S.1 Series and Appendix.

1. Bring frames into compliance with WDMA Industry Standard I.S.1 Series and Appendix prior to installation of doors.
- B. Hardware: For installation, refer to Division 8 Section "Door Hardware."
- C. Install doors pursuant to door manufacturer's published instructions and WDMA Industry Standard I.S.1 Series and Appendix.
  1. Install fire-rated doors pursuant to requirements of NFPA 80 and WDMA Standards and Instructions.
  2. Seal cut in prefinished doors pursuant to door manufacturer's published instructions.
  3. Putty all nail/staple holes in wood glass trim. Putty shall match wood door color.
- D. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
  1. Clearances: Provide 1/8-inch at heads, jambs, and between pairs of doors. Provide 1/8-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch from bottom of door to top of threshold.
    - a. Comply with NFPA 80 for fire-rated doors.
  2. Bevel non-fire-rated doors 1/8-inch in 2-inches at lock and hinge edges.
  3. Bevel fire-rated doors 1/8-inch in 2-inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project Site.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

### 3.03 CLEANING

- A. Clean doors pursuant to door manufacturer's published instructions.

### 3.04 PROTECTION

- A. Protect doors, as recommended by door manufacturer, to ensure that wood doors will be without damage and/or deterioration at time of Substantial Completion.

## END OF SECTION 081429

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.
- B. Section 033000 - Cast-In-Place Concrete
- C. Section 042200 - Concrete Unit Masonry
- D. Section 054000 - Cold-Formed Metal Framing
- E. Section 092116 - Gypsum Board Assemblies
- F. Section 099100 - Painting.

## 1.02 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements

## 1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Fire Rated Access Doors For Walls: Complete assemblies complying with Underwriter's Laboratories, Inc (UL) requirements for 1-1/2 hour "B Label" rating. Identify each assembly with UL label.
  - 2. Fire Rated Access Doors For Ceilings: Complete assemblies complying with Warnock Hersey (WHI) requirements for one-hour rating in wood-framed assemblies and three-hour rating in non-combustible assemblies. Identify each assembly with WHI label and NFPA requirement indicating "For Horizontal Installation".

## PART 2 PRODUCTS

## 2.01 ALL ACCESS DOORS

- A. Doors in insulated assemblies must be insulated and weatherstripped.
- B. Doors in wet locations are to be Stainless Steel, U.N.O.

## 2.02 NON-FIRE RATED ACCESS DOORS FOR WALLS AND CEILINGS

- A. Frames: Minimum 16 gage steel.
  - 1. Flange: Integral exposed flange not less than 3/4-inch wide around the perimeter.
    - a. Plaster Applications: Expanded metal lath and exposed casing bead welded to perimeter of frame, in place of integral exposed flange.
    - b. Acoustical Tile Applications: Frames without exposed flange.
  - 2. Finish: Match door panel.
  - 3. Anchorage, Except for New Concrete or Masonry Construction: Predrilled holes in frame for anchoring with fasteners.
  - 4. Anchorage for New Concrete or Masonry Construction: Adjustable metal masonry anchors.
- B. Door Panel: Flush type, minimum 14 gage steel.

1. Hinges: Concealed type set to open a minimum of 135 degrees; continuous type, or sufficient number to support the door size.
  2. Finish: Factory-applied rust inhibitive baked enamel or primer over phosphate treated steel.
- C. Door Panel: Recessed type, minimum 18 gage steel with face of panel formed to provide a 1 inch recessed surface for application of finish material, and reinforced as required to prevent buckling.
1. Hinge: Continuous type hinge.
  2. Finish: Factory-applied rust-inhibitive baked enamel or primer over phosphate treated steel.
  3. Plaster Applications: Self-furring 3.4 lb. per sq. yd. galvanized expanded metal mesh welded to panel face and casing bead welded to perimeter of panel.
- D. Cam Locks: Flush, screwdriver operated; sufficient number to hold door panel in flush, smooth plane when closed.
- E. Cam Locks: Flush screwdriver or key operated; sufficient number to hold door panel in flush, smooth plane when closed.
1. One lock on each door panel shall be key operated, pin tumbler type. The remaining locks, if any, shall be screwdriver operated type.
  2. One lock on each door panel shown or scheduled shall be key operated, pin tumbler type. The remaining locks shall be screwdriver operated type.
  3. Key all locks alike. Furnish 4 keys total.
- F. Sleeves (For Recessed Type Door Panels): One for each locking device.
1. Plaster Ceilings: Integral steel sleeves welded to panel face with plastic grommet on exposed end.
  2. Acoustic Tile or Gypsum Board Ceilings: Plastic grommets for installation in holes cut thru ceiling finish material.
  3. Metal Panel Ceilings: Coordinate with metal panel ceiling manufacturer.

### 2.03 FIRE RATED ACCESS DOORS FOR WALLS AND CEILINGS

- A. Frames: Minimum 16 gage steel, with integral exposed flange not less than one inch wide around the perimeter.
1. Anchorage, Except for New Concrete or Masonry Construction: Predrilled holes in frame for anchoring with fasteners.
  2. Anchorage for New Concrete or Masonry Construction: Adjustable metal masonry anchors.
- B. Door Panel: Flush type, minimum 20 gage steel double wall construction with insulation, equipped with automatic closer and inside release mechanism.
1. Hinge: Concealed pin hinge or continuous hinge set to open to approximately 100 degrees.
- C. Finish: Factory-applied baked enamel or primer over phosphate treated steel.
- D. Automatic Latches: Direct action knurled knob or turn ring operated; sufficient number to hold door panel in flush, smooth plane when closed. Equip each latch with inside release device.
- E. Automatic Latches: Direct action knurled knob or turn ring, or key operated; sufficient number to hold door panel in flush, smooth plane when closed. Equip each latch with inside release device.
1. A flush key will operate one latch on each door panel. The remaining latches, if any, shall be knurled knob or turn ring-operated type.

2. A flush key will operate one latch on each door panel that is shown or scheduled. The remaining latches shall be knurled knob or turn ring-operated type.
  - a. Furnish 4 flush keys total.
3. One latch on each door panel shall have either mortise preparation or rim cylinder latch: Builders Hardware Manufacturers Association, Inc. (BHMA) standard cylinder provided under Section 087100.
4. One latch on each door panel shown or scheduled shall have either mortise preparation or rim cylinder latch: Builders Hardware Manufacturers Association, Inc. (BHMA) standard cylinder provided under Section 087100.
5. Each latch on each door panel shall be operated by a flush key.
  - a. Furnish 4 flush keys total.
  - b. One latch on each door panel shall have either mortise preparation or rim cylinder latch: Builders Hardware Manufacturers Association, Inc. (BHMA) standard cylinder provided under Section 087100.
  - c. One latch on each door panel shown or scheduled shall have either mortise preparation or rim cylinder latch: Builders Hardware Manufacturers Association, Inc. (BHMA) standard cylinder provided under Section 087100 - Door Hardware.

#### 2.04 FABRICATION

- A. Assemble access doors as integral units complete with all parts and ready for installation. Fabricate units of continuous welded steel construction unless otherwise indicated or specified. Grind welds smooth and flush with adjacent surfaces. Anchorage devices shall be of size and type required to secure access doors to types of supports indicated on the Drawings.
  1. Allowable Size Variations: Manufacturer's standard size units that vary slightly from the sizes indicated may be acceptable, subject to the approval of the Director.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install the access doors in accordance with the manufacturer's printed installation instructions, except as shown or specified otherwise.
- B. Coordinate access door installation with installation of supporting construction.
- C. Set units accurately in position and securely attach to supports with face panel plumb or level in relation to adjoining finish surface.
- D. Install access doors in location as shown on the drawings or location determine by the Architect.

#### 3.02 ADJUSTING

- A. Adjust hardware and doors for proper operation.

#### 3.03 SCHEDULE

- A. Provide non-fire rated access doors in non-fire rated construction and fire rated access doors in fire rated construction.

### END OF SECTION 083113

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.
- B. Division 26 - Electric.

## 1.02 SUMMARY

- A. Furnish and install new commercial, sectional overhead doors, operators, controls and wiring from individual door operators to door motors as shown on the Contract Drawings.
- B. Wiring and conduits from each overhead door to Radio Room or other remote location are the responsibility of the Contractor.
- C. Connection to other systems is the responsibility of the Contractor.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM A924 "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process".
- C. ASTM A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
- D. ANSI/DASMA 102 - "American National Standard Specifications for Sectional Overhead Type Doors".
- E. ANSI/DASMA 105 - "Test Method for Thermal Transmittance and Air Filtration of Garage Doors".

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements
- C. Product Data: Submit product literature specific to the model being submitted, installation, operating and maintenance instructions.
- D. Shop Drawings: Submit shop drawings which show compliance with specified qualities and the way sectional overhead doors fit in with and are fastened to rest of the Work including interface with power systems. Provide shop drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, operator mounts, remote operator specifications and other related information.
- E. Samples: Submit three (3) color cards of all available colors for initial color selection by Architect. Submit three (3) physical samples (approximately 4" x 4") in the color(s) and finish selected by the Architect for final color approval.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

- G. Warranty: Submit sample warranty for door section and hardware, insulation delamination, operator, and paint finish.
- H. Door Installer: Submit qualifications of door installer indicating the installer meets the following requirements:
  - 1. Authorized Distributor/Installer.
  - 2. Years of experience.
  - 3. Emergency Service.
  - 4. Travel time to project.
- I. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner in the form of a standard five-year maintenance agreement, starting on the date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options. Owner is under no obligation to accept maintenance proposal and may negotiate any aspect of the agreement.

#### 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this section.
- B. Door Installer must be an authorized distributor of the manufacturer of the doors and openers with a minimum of five (5) years documented experience, to be assured of accessibility to parts, updated product changes, recalls and warranty claims. Door installer must offer 24/7 emergency service and be located within 60 miles of the project.
- C. Operator manufacturer must be the same manufacturer as door manufacturer to eliminate any questions or problems with warranty claims.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

#### 1.07 WARRANTY

- A. Warranty: 1-year limited warranty. Component parts to be free from defects in material and workmanship for a period of one year from date of substantial completion. Door shall be free from delamination of the insulation to the skins for ten (10) years from installation date.

### PART 2 PRODUCTS

#### 2.01 OVERHEAD DOORS - PHASE 1 DOORS OH1 - OH5 AND PHASE 2 DOOR OH6

- A. Doors shall be steel sectional insulated overhead, with lites as shown on the Contract Drawings. Overhead doors shall be as manufactured by:
  - 1. Thermaseal® Series, Model TM300 as manufactured by Raynor Garage Doors, 1101 East River Road, Dixon, IL 61021, Phone 800-472-9667. (Basis of Specification)
  - 2. Thermacore AP, Model 850 as manufactured by Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067, Phone 800-275-3290. (Must meet or exceed all specification requirements)
  - 3. Architect Approved Equivalent 3" thick door.
- B. Door Sections:

1. Doors consisting of sections to be 3" thick roll formed from commercial quality hot dipped galvanized (G40 exterior) steel complying with ASTM A-653. Door sections constructed of 26 gauge (exclusive of finish) interior and exterior skins. Lites as shown on the Contract Drawings.
  2. Interior and exterior skins to be mechanically interlocked and pressure bonded to an expanded polyurethane foam core with a minimum R-value of 24.54.
  3. Interior and exterior skins to be separated by a continuous dual durometer vinyl extrusion to form an effective thermal break and a complete weather-tight seal along section joint.
  4. Thermal break extrusion to be held in place by means of mechanical interlock.
  5. End stiles to be minimum 16 gauge separated from exterior skin with a thermal break.
  6. Hinge reinforcement strips shall be 20-gauge galvanized steel.
- C. Finish:
1. Exterior door skin pre-coated prior to roll forming with an epoxy primer. Provide two coats baked on polyester finish or Kynar finish as identified below.
  2. Surface Texture: Stucco embossed and pencil groove exterior and interior.
- D. Color:
1. Color to be Kynar finish black.
- E. Weatherstripping:
1. Door to be fully weather-stripped (extreme weather condition type) to reduce air infiltration. Top of door with EPDM rubber sealing strips.
  2. Bottom of door to have flexible U shaped black ribbed EPDM seal encased in extruded aluminum retainer to conform to irregularities in floor. Bottom seal must be encased in aluminum retainer, not screwed into bottom section. Jamb seal to be EPDM rubber blade type attached to track angle mounting with rigid vinyl snap on extrusion.
  3. Weather-stripping to be replaceable without removal of track, angle mounting, or door hardware. . No air leakage shall be detected between section joints when tested in accordance with ASTM E-283.
  4. Provide IECC (International Energy Conservation Code) compliant Overhead Doors.
    - a. Air Infiltration at 25mph: 0.19 cfm/sq.ft.
- F. Tracks:
1. Hot dipped galvanized 12-gauge track per ASTM A-653, 3". Tracks to have graduated seal for weathertight closing.
  2. See Contract Drawings for track profile and heights.
  3. Tracks to be continuous angle mounted and fully adjustable for sealing door to jamb. Continuous angle mount to be not less than 11-gauge steel angle, 2-5/16" x 5" for 3-inch track. Horizontal track to be adequately reinforced with continuous angle.
  4. Hanger Angle: 11-gauge
- G. Track Stops:
1. Provide manufacturers standard stop at the end of the overhead door track.
- H. Hardware:
1. Provide full, heavy duty (11gauge) hinges and brackets made from galvanized steel.
  2. Provide 3" diameter, heavy duty track rollers with ten (10) hardened steel ball bearings.
- I. Spring Counterbalance:
1. Heavy Duty oil tempered wire torsion springs on continuous solid, ball bearing cross header shaft. Galvanized aircraft type lifting cables w/minimum safety factor of 5 to 1. 50,000 Cycle springs for extended spring life.
- J. Windload:



1. Windload to withstand 20 lb. per sq. ft. Deflection of door in horizontal position to be a maximum 1/120th of door width.
- K. Glazing:
1. 5/8" Insulated Guardian SunGuard Glass with low E, tempered and tinted light gray.
    - a. SunGuard Coating: Neutral 40 (#2)
    - b. SunGuard Product Series: High Performance Low-E
    - c. Outboard Substrate: Crystal Gray
    - d. Inboard Substrate: Clear
    - e. Exterior Appearance: Light Gray
  2. Configuration of Lites as shown on Drawings.
- L. Thermal Conductivity:
1. When calculated in accordance with ASTM C-518 the door must test for the following energy values. Minimum R-Value = 24.54 (U Value = 0.040). Insulation must not be manufactured with nor contain chlorofluorocarbons (CFC) which are known to have harmful effects on the earth's ozone layer and the environment.
- M. Electric Operators:
1. Operator shall be Raynor Control Hoist Optima, 1/2 HP (continuous), single-phase garage door operators, industrial duty, belt-drive, jackshaft with manual chain hoist, auxiliary contact type-SR-2 wiring-pneumatic safety edge, reversing equipment.
  2. Motor; provide continuous duty motor. Motor shall be separate from reduction mechanism for ease of maintenance.
  3. Reduction: Furnish V-belt drive from motor to full ball bearing power train with additional reduction by chain and sprockets. All power train shafts shall be a minimum 3/4" diameter.
  4. Roller Chain Drive - door shall be driven by roller chain at 6" to 12" per second.
  5. Adjustable Friction Clutch shall be provided to protect door and operator if door movement is obstructed.
  6. Starter - Reversing Contactor type (Type RGJH). Furnish heavy duty across the line reversing type with mechanical interlock.
  7. Limit switches - provide positive chain drive screw type limit switch, enclosed in electrical control box, easily accessible for precision setting. Limit switches will remain in time when emergency chain hoist is used and door is operated manually.
  8. Provide auxiliary output module with the capability to integrate with other devices including:
    - a. Dry relay contacts at door limit positions.
    - b. Lamp output contacts.
    - c. Selectable ADA outputs to sound a horn or run a flashing light.
    - d. Multiple relay contact points.
  9. Provide Model #300320 RC Operator Pushbuttons - Flush Mounted.
- N. Control Wiring:
1. Provide long distance module. Control wiring shall be 24 volts for safety.
  2. Three button (open-close-stop) to be installed at each door. Provide SR2 Three button momentary contact on open-close-stop. Open override feature. Open button, photo eye and pneumatic safety edge will reverse door to open position when door is closing. Doors to be equipped with pneumatic safety edge for protection against damage to door on contact of object.
  3. Provide additional individual three button (open-close-stop) to be installed in the Office (Phase 1) and the Radio Room (Phase 2) to operate each individual overhead door. Provide Model #300320 RC Operator Pushbuttons - Flush Mounted in the Office. Flush mounted overhead door switches can not be installed in gang boxes.
  4. Push button station must be wired to allow the door to fully open and then closed to within 1 foot of the floor for 5 minutes and then closed completely. There must also be an override to allow the door to be closed completely. Door push button must also be wired to

start exhaust fans when being opened and then shut the fans off when the doors are fully closed with an override control. Open button, and pneumatic safety edge will reverse door to open position when door is closing.

5. Provide heavy duty through-beam car wash (NEMA 4X rated) photoelectric reversing system for each door to reverse door's downward path if visible beam is broken. Photo-eye to utilize interference reduction technology.
  6. Provide and install master control panel to operate all (doors with open-close-stop) from the Office (Phasen1) and Radio Room (Phase 2). Provide individual switches with pilot lights for each door. Pilot lights to show door closed and door open. Long Wiring Kit to ensure proper voltage for multiple push button stations. Provide a brushed stainless-steel bevel with finished edges for installation of the switches in a laminate console.
  7. Overload Protection - Provide manual reset for over load protection. All electrical components shall be in NEMA 1 enclosure. Horsepower of Motor to be of manufacturers standards based on the size and weight of the door.
  8. Emergency operation - Supply a chain hoist that may be engaged from the floor for mechanical operation. An electric interlock disconnects power when the chain hoist is engaged.
  9. Magnetic Brake - furnish magnetic solenoid brake for positive stop.
  10. Provide and install contacts in all three button controls to turn off apparatus bay heating pump when doors open.
    - a. Provide override switch located in apparatus bay to turn on exhaust fans when door(s) open.
    - b. Override shall have an indicator light to show that furnace or heaters are on.
- O. Receivers and Transmitters:
1. Provide individual receivers to operate each overhead door.
  2. Provide four channel, four button transmitters to operate overhead doors shown on the Drawings. Total quantity of transmitters shall be equal to number of overhead doors plus two (2).

## PART 3 EXECUTION

### 3.01 EXAMINATION AND PREPARATION

- A. Examine existing conditions in Work before installing doors. In the Record Documents, list unsatisfactory conditions and steps taken to correct them.
- B. Correct unsatisfactory conditions before installing doors. Beginning installation shall mean acceptance of related work and corrected existing conditions by installer and Contractor.

### 3.02 INSTALLATION

- A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings and manufacturer's instructions.
- B. Connect door controls and operating devices to other building systems such as power systems.
- C. Select, identify, and locate controls so that safety of users and protection of property and vehicles is ensured.
- D. Provide inserts, anchors, hangers, brackets, moldings, seal strips, and welding as needed to make door assembly secure against air pressure, operating loads and intrusion, and so that air infiltration is held to minimum. Conceal bolt heads so that access cannot be made from outside.
- E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

- F. Completely remove from all components bar codes, visible markings and shipping labels. Clean away all residues from tags and stickers. Clean installed products in accordance with manufacturer's instructions prior to substantial completion.
- G. Lubricate bearings, rollers and sliding parts in accordance with manufacturer's recommendations.
- H. When door assembly is complete and hooked up to other systems test and adjust doors until they operate easily and quietly, maintaining airtightness and water tightness, under all conditions of normal and emergency use. Doors must be in full contact with weather stripping.
- I. Re-adjust doors just prior to substantial completion and after installation of any finished flooring materials.

### 3.03 DEMONSTRATION AND TRAINING

- A. Upon completion of installation, demonstrate proper operation and maintenance to the Owner.
- B. Verify with Owner the following:
  - 1. All safety devices on every door are functioning as designed.
  - 2. All pushbutton operators and remote operators function as designed.

**END OF SECTION 083613**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.
- B. Division 26 - Electric.

## 1.02 SCOPE

- A. Furnish labor and materials necessary to install a complete system.
- B. Furnish and install new commercial sectional rail and stile overhead doors, operators, controls and wiring from individual door operators to door motors as shown on the Contract Drawings.
- C. Wiring and controls from each overhead door to Radio Room push buttons, accessories, and/or other remote operator locations are the responsibility of the Electrical Contractor.
- D. Connection to other systems is the responsibility of the Electrical Contractor.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM A924 "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process".
- C. ASTM A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
- D. ANSI/DASMA 102 – "American National Standard Specifications for Sectional Overhead Type Doors".
- E. ANSI/DASMA 105 – "Test Method for Thermal Transmittance and Air Filtration of Garage Doors".

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 – Submittal Procedures.
- B. Pursuant to Section 016000 – Product Requirements.
- C. Product Data:
  - 1. Product literature specific to the model being submitted, installation, operating and maintenance instructions.
  - 2. Product literature for any specified accessories. Some accessories may be supplied from sources other than the Overhead Door manufacturer. If accessories require factory programming, submit programming options for Owner's selection.
- D. Installation Instructions:
  - 1. Provide installation instructions for door operator, controls, and accessories.
- E. Shop Drawings:

1. Submit shop drawings which show compliance with specified qualities and the way rail and stile overhead doors fit in with and are fastened to rest of the Work. Provide shop drawings indicating track details/profiles, head and jamb conditions, glazing locations, spring shafts, anchorage, accessories, finish colors, operator mounts, remote operator specifications and other related information.
  2. Submit schematic wiring diagrams showing connections to:
    - a. Building electrical system.
    - b. All overhead door push button locations.
    - c. All overhead door safety and alerting accessories.
    - d. Deactivation and reactivation of other building systems.
- F. Samples: Submit three (3) color cards of all available colors for initial color selection by the Architect. Submit three (3) physical samples (approximately 4" x 4") in the color(s) and finish selected by the Architect for final color approval.
- G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- H. Warranty: Submit sample warranty for door section and hardware, insulation delamination, operator and finish.
- I. Door Installer: Submit qualifications of door installer indicating the door installer meets the following requirements:
  1. Authorized Distributor/Installer.
  2. Years of experience.
  3. Emergency Service.
  4. Travel time to project.
- J. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner in the form of a standard five-year maintenance agreement starting on the date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options. Owner is under no obligation to accept maintenance proposal and may negotiate any aspect of the agreement.

#### 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this section.
- B. Door Installer must be an authorized distributor of the manufacturer of the doors and openers with a minimum of five (5) years documented experience, to be assured of accessibility to parts, updated product changes, recalls and warranty claims. Door installer must offer 24/7 emergency service and be located within 60 miles of the project.
- C. Operator manufacturer must be the same manufacturer as door manufacturer to eliminate any questions or problems with warranty claims.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

#### 1.07 WARRANTY

- A. AlumaView® Limited Warranty: Raynor warrants the door sections against defects in material and workmanship for five years from date of delivery to the original purchaser. Window

components are warranted against defects in material and workmanship for three years from date of delivery to the original purchaser. Raynor warrants all hardware and spring components against defects in material and workmanship for one year (or cycle life of the springs) from date of delivery to the original purchaser. Additional Limited Warranty requirements in accordance with manufacturer's full standard limited warranty documentation. AlumaView® Limited Warranty: Raynor warrants the door sections against defects in material and workmanship for five years from date of delivery to the original purchaser. Window components are warranted against defects in material and workmanship for three years from date of delivery to the original purchaser. Raynor warrants all hardware and spring components against defects in material and workmanship for one year (or cycle life of the springs) from date of delivery to the original purchaser. Raynor warrants ArmorBrite powdercoat finish for three years against cracking and/or peeling. Additional Limited Warranty requirements in accordance with manufacturer's full standard limited warranty documentation.

- B. Door operator shall be warranted for three (3) years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 RAIL & STILE OVERHEAD DOORS- PHASE 2 DOORS OH1 - OH5

- A. Doors shall be aluminum sectional rail and stile door type with glazing and insulated panels as shown on the Contract Drawings. Rail and stile doors as manufactured by:
1. AlumaView® AV 300 as manufactured by Raynor Garage Doors, PO Box 448, 1101 East River Rd., Dixon, IL 61021, Phone 800-472-9667. (Basis of Design and Specification)
  2. Architect Approved Equivalent **3" thick** door with capability to accommodate 1" thick insulated glazing.
- B. Material: Sections shall be 3 inches thick or manufacturer's standard as long as trussing is internal, comprised of 6036-T6 aluminum alloy stiles and rails joined together with 5/16-inch diameter screws. Insulated aluminum sandwich panels ½ inch thick shall fill the spaces between the stiles and rails and held in place by vinyl snap-in beads where glazing is not shown. The combined dimension of the two adjoining intermediate meeting rails shall be 5 inches. End stiles shall be 6-1/2 inches wide as determined by overall door width. Center stiles shall be 3-5/8 inches wide. Bottom and top rail height to be 6-1/2 inches. U-Bar trussing must be built into the rails. **Surface mounted trussing is not acceptable.**
- C. Color:
1. All frame extrusions and filler panels shall be finish coated with ArmorBrite Powdercoat color to match Raynor Kynar Black Anodize as selected..
- D. Weatherstripping:
1. Door to be fully weather-stripped to reduce air infiltration. Top of door with EPDM rubber sealing strips.
  2. Bottom of door to have flexible U shaped black ribbed EPDM seal encased in extruded aluminum retainer to conform to irregularities in floor. Bottom seal must be encased in aluminum retainer, not screwed into bottom section. Jamb seal to be EPDM rubber blade type attached to track angle mounting with snap on PVC retainer.
  3. Weather-stripping to be replaceable without removal of track, angle mounting, or door hardware.
  4. Air Infiltration at 25 MPH: 0.24 cfm/sq ft.
  5. Provide optional IECC Compliance Package.
- E. Tracks:
1. Hot dip galvanized 13-gauge track per ASTM A-653, 3". Tracks to have graduated seal for weathertight closing.
  2. See drawings for track profile and heights.

3. Tracks to be continuous angle mounted and fully adjustable for sealing door to jamb. Continuous angle mount to be not less than 1/8" thick steel angle, 3-1/2" x 5" for 3-inch track. Horizontal track to be adequately reinforced with continuous angle.
  4. Hanger Angle: Minimum 11-gauge.
- F. Track Stops:
1. Provide manufacturers standard stop at the end of the overhead door track.
- G. Hardware:
1. Provide full, heavy duty (11 gauge) hinges and brackets made from galvanized steel.
  2. Provide 3" diameter, heavy duty track rollers with ten (10) hardened steel ball bearings.
- H. Spring Counterbalance:
1. Heavy Duty oil tempered wire torsion springs on continuous ball bearing cross header shaft. Galvanized aircraft type lifting cables w/minimum safety factor of 5 to 1. 50,000 Cycle springs for extended spring life.
- I. Windload:
1. Wind load to withstand 20 lb. per sq. ft. Deflection of door in horizontal position to be a maximum 1/120th of door width.
  2. Wind Load (AV300): Florida Building Code Product Approval #FL16225 large missile impact.
- J. Glazing:
1. 1" Insulated Guardian SunGuard Glass with low E, tempered and tinted light gray.
    - a. SunGuard Coating: Neutral 40 (#2)
    - b. SunGuard Product Series: High Performance Low-E
    - c. Outboard Substrate: Crystal Gray
    - d. Inboard Substrate: Clear
    - e. Exterior Appearance: Light Gray
  2. Configuration of Lites as shown on Drawings.
- K. Electric Operators:
1. Operator shall be Raynor Control Hoist Optima, 1/2 HP, 208V three-phase garage door operators, industrial duty, belt-drive, jackshaft, auxiliary contact type-SR-2 wiring-pneumatic safety edge, reversing equipment with hoist.
  2. Motor; provide continuous duty motor. Motor shall be separate from reduction mechanism for ease of maintenance.
  3. Reduction: Furnish V-belt drive from motor to full ball bearing power train with additional reduction by chain and sprockets. All power train shafts shall be a minimum 3/4" diameter.
  4. Roller Chain Drive - door shall be driven by roller chain at 6" to 12" per second.
  5. Adjustable Friction Clutch shall be provided to protect door and operator if door movement is obstructed.
  6. Starter - Reversing Contactor type (Type RGJH). Furnish heavy duty across the line reversing type with mechanical interlock.
  7. Limit switches - provide positive chain drive screw type limit switch, enclosed in electrical control box, easily accessible for precision setting. Limit switches will remain in time when emergency chain hoist is used, and door is operated manually.
  8. Provide auxiliary output module with the capability to integrate with other devices including:
    - a. Dry relay contacts at door limit positions.
    - b. Lamp output contacts.
    - c. Selectable ADA outputs to sound a horn or run a flashing light.
    - d. Multiple relay contact points.
  9. Provide Model #300320 Pushbuttons – Flush Mounted for each overhead door.

- L. Control Wiring:
1. Provide long distance module. Control wiring shall be 24 volts for safety.
  2. Three button (open-close-stop) to be installed at each door. Provide SR2 Three button momentary contact on open-close-stop. Open override feature. Open button, pneumatic safety edge, or photoelectrics will reverse door to open position when door is closing. Doors to be equipped with pneumatic safety edge for protection against damage to door on contact of object.
  3. Provide heavy duty through-beam car wash (NEMA 4X rated) photoelectric reversing system for each door to reverse door's downward path if visible beam is broken. Photo-eye to utilize interference reduction technology.
  4. Provide and install individual Model #300320 Pushbuttons – Flush Mounted in the Radio Room for each overhead door. Long Distance Module to ensure proper voltage for multiple push button stations.
  5. Door push button must also be wired to start exhaust fans when being opened and then shut the fans off when the doors are fully closed with an override control. Open button, and pneumatic safety edge will reverse door to open position when door is closing.
  6. Overload Protection - Provide manual reset for over load protection. All electrical components shall be in NEMA 1 enclosure. Horsepower of Motor to be of manufacturers standards based on the size and weight of the door.
  7. Emergency operation - Supply a chain hoist that may be engaged from the floor for mechanical operation. An electric interlock disconnects power when a chain hoist is engaged.
  8. Magnetic Brake – furnish magnetic solenoid brake for positive stop.
  9. Provide and install contacts in all button controls to turn off apparatus bay heating units when doors open.
    - a. Provide override switch located in apparatus bay to turn on exhaust fans when door(s) open.
    - b. Override shall have an indicator light to show that furnace or heaters are on.
- M. Accessories:
1. Receivers and Transmitters:
    - a. Provide individual receivers to operate each overhead door.
    - b. Provide four channel, four button transmitters to operate overhead doors shown on the Contract Drawings. Total quantity of transmitters shall be equal to number of overhead doors plus two (2).

### PART 3 EXECUTION

#### 3.01 EXAMINATION AND PREPARATION

- A. Examine existing conditions in Work before installing doors. In the Record Documents, list unsatisfactory conditions and steps taken to correct them.
- B. Correct unsatisfactory conditions before installing doors. Beginning installation shall mean acceptance of related work and corrected existing conditions by installer and Contractor.

#### 3.02 INSTALLATION

- A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings and manufacturer's instructions.
- B. Coordinate with Electrical Contractor to connect door controls and operating devices to other building systems such as power systems.



- C. Select, identify, and locate controls so that safety of users and protection of property and vehicles is ensured.
- D. Provide inserts, anchors, hangers, brackets, moldings, seal strips, and welding as needed to make door assembly secure against air pressure, operating loads and intrusion, and so that air infiltration is held to minimum. Conceal bolt heads so that access cannot be made from outside.
- E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- F. Completely remove from all components bar codes, visible markings and shipping labels. Clean away all residues from tags and stickers. Clean installed products in accordance with manufacturer's instructions prior to substantial completion.
- G. Lubricate bearings, rollers and sliding parts in accordance with manufacturer's recommendations.
- H. Install and wire (where applicable) all accessories.
- I. Program door operator output module, door operator, and any door accessories to Owner's requirements.
- J. When door assembly is complete and hooked up to other systems, test and adjust doors until they operate easily and quietly, maintaining airtightness and water tightness, under all conditions of normal and emergency use. Doors must be in full contact with weather stripping.
- K. Re-adjust doors just prior to substantial completion and after installation of any finished flooring materials.

### 3.03 DEMONSTRATION AND TRAINING

- A. Upon completion of installation, demonstrate proper operation and maintenance to the Owner.
- B. Verify with Owner the following:
  - 1. All safety devices on every door are functioning as designed.
  - 2. All pushbutton operators and remote operators function as designed.

**END OF SECTION 083613.11**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Exterior aluminum-framed storefronts.
  - 2. Interior storefront framing.
  - 3. Manual swing aluminum entrance doors and door frame units.
  - 4. Engineering design of storefront systems.
- B. Related specification sections include the following:
  - 1. Section 079200 - "Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
  - 2. Section 084413 - Glazed Aluminum Curtain Wall.
  - 3. Section 087100 - "Door Hardware" for hardware to the extent not specified in the Section. Closers and panic devices are to be provided by single source for all locations throughout project.
  - 4. Section 088000 - "Glazing" for glazing requirements to the extent not specified in this Section.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. AA 45 "The Aluminum Association Designation System for Aluminum Finishes".
- C. AAMA CW-10 - "Care and Handling of Architectural Aluminum from Shop to Site".
- D. AAMA 501.2 - "Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems".
- E. AAMA 611 - "Voluntary Specification for Anodized Architectural Aluminum".
- F. AAMA 1503 - "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Door and Glazed Wall Sections".
- G. AAMA 2605 - "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix)".
- H. ANSI H35.2 "American National Standard Dimensional Tolerances for Aluminum Mill Products".
- I. ASTM B221 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes".
- J. ASTM E283 - "Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen".
- K. ASTM B633 "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel".

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- D. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
  - 3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Installer Qualifications.
- G. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including pre-construction testing, field testing, and in-service performance

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Protect against any damage. Handle to avoid racking and excessive or improperly applied loads.

## 1.07 PERFORMANCE REQUIREMENTS

- A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
  - 1. Design Wind Loads: Comply with requirements of IBC - International Building Code (latest edition).
  - 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq. ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E 283.
- D. Condensation Resistance Factor: CRF of not less than 57 (exterior frames) when measured in accordance with AAMA 1503.1.
- E. Thermal Resistance of Exterior Framing: Thermal transmittance U value not more than 0.38 BTU/HR/FT<sup>2</sup>/°F when measured in accordance with AAMA 1503.1.
- F. Total system u-factor to not exceed .77 as per NYS 2020 Energy Code. SHGC to not exceed .38.
- G. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 12 lbs./sq. ft.
- H. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- I. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170° F over a 12-hour period without causing detrimental effect to system components, anchorages, and other building elements.

## 1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Adhesive or cohesive sealant failures.
    - e. Water leakage through fixed glazing and framing areas.
    - f. Failure of operating components.
  - 2. Warranty Period: Five Years (Class I Anodized) from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in

materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. EFCO Corporation (EFCO).
  2. Kawneer, An Arconic Company.
  3. Architect Approved Equivalent.

#### 2.02 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  1. Sheet and Plate: ASTM B 209
  2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221
  3. Extruded Structural Pipe and Tubes: ASTM B 429
  4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
  1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M
  2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M
  3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M

#### 2.03 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing".
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

#### 2.04 ENTRANCE DOOR SYSTEM

- A. Products:
  1. EFCO; D518 Heavy Duty Entrance Door.
  2. Kawneer; AA 425 Thermal Entrance.
  3. Architect Approved Equivalent.

- B. Entrance Doors: manufacturer's standard glazed entrance doors for manual-swing operation.
  - 1. Door Construction: 2 1/4-inch overall thickness, with minimum 0.125-inch thick, extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated, and fillet welded or that incorporate concealed tie rods.
  - 2. Door Design: Wide stile; 4 1/4-inch nominal width and 10" bottom rail.
  - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide non-removable glazing stops on outside of door.
  - 4. Provide an integral 1/2-inch diameter wire tube in doors to receive electrified locksets, panic bars, mortised electric locksets, or electric strikes in the inactive leaf of pairs of doors to accommodate wiring associated with power transfer hinges, knuckles, and electrified hardware within the door.

#### 2.05 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Door hardware other than that furnished by this Section, as specified in Specification Section 087100 - "Door Hardware" and in hardware sets included in the Door and Hardware Schedule.
- B. Weather Stripping: Manufacturer's standard replaceable components.
  - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
  - 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- D. Silencers: BHMA A156.16, Grade 1.

#### 2.06 ACCESSORY MATERIAL

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, furnished and installed by Division 07 Section "Sealants".
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

#### 2.07 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects of deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  - 4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  6. Provisions for field replacement of glazing from exterior.
  7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using screw-spline system.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
  2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. Prepare doors to receive security systems hardware in accordance with final security systems shop drawings and templates provided by security systems hardware supplier.
- J. After fabrication, clearly mark components to identify their locations in Project according to shop drawings.

## 2.08 FINISHES

- A. Finish: Providing coverage on all exposed areas of aluminum components.
1. Color to be Black anodized

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Erect level, square, plumb, and in alignment with other elements of the Work; and pursuant to manufacturer's published instructions.
- B. Seal all joints watertight between framing and adjacent construction.
- C. Apply isolating coating at a rate of at least 1.6 to 2.1 mils, dry film thickness, where aluminum contacts other metals, concrete, plaster, or other alkaline materials.
1. In contact with other metals: apply coating to other metal.
  2. In contact with alkaline material: apply coating to aluminum.
- D. Provide perimeter anchors of sufficient size, adequate material, and proper spacing to transmit all loads into building structure. Isolate carbon steel anchors from aluminum.

**3.02 TOLERANCES**

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

**3.03 ADJUSTING**

- A. Adjust operating hardware and sash for smooth operation.

**3.04 CLEANING**

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

**3.05 PROTECTION**

- A. Protect exposed aluminum surfaces against any damage from subsequent construction activities and from any contaminants, including, but not limited to, concrete, mortar, plaster, lime, acid, paint, spray foam insulation and waterproofing materials.
- B. Remove and replace all damaged materials.

**END OF SECTION 084113**



## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes aluminum windows including trims and accessories (Phase 1).

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.
- D. Environmental Product Declaration (EPD):
  - 1. Include a Type III Product-Specific EPD created from a Product Category Rule.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

## 1.06 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of materials and finishes beyond normal weathering.
    - e. Failure of insulating glass.

2. Warranty Period:
  - a. Window units: 2 years from date of Substantial Completion.
  - b. Painted Metal Finishes:
    - 1) Five years from date of Substantial Completion for an AAMA 2603 Baked Enamel Finish
    - 2) Ten years from date of Substantial Completion for an AAMA 2604 High-Performance Finish
    - 3) Twenty years from date of Substantial Completion for an AAMA 2605 High-Performance Finish

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Kawneer North America: an Alcoa company: 8400TL Thermal Horizontal Slider units.
  2. Architect approved equivalent.
- C. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

### 2.02 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
  1. Window Certification: AMMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
  1. Minimum Performance Class AW - Architectural Window. Designation: HS-AW70 - 99 inches by 79 inches (XX).
  2. Structural Performance:
    - a. Uniform Load Structural Test: 150 percent of Design Pressure.
- C. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure based on testing performed according to AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS), Uniform Load Deflection Test or structural computations.
- D. Uniform Load Deflection: A minimum static air pressure difference of 70 psf (3352 Pa) shall be applied in the positive and negative direction in accordance with ASTM E330/E330M. There shall be no deflection in excess of L/175 of the span of any framing member.
- E. Uniform Load Structural Test: A minimum static air pressure difference of 105 psf (5027 Pa) shall be applied in the positive and negative direction in accordance with ASTM E330/E330M. The unit shall be evaluated after each load.
- F. Thermal Transmittance: When tested to AAMA 1503, AAMA specification 507 or NFRC 100 the thermal transmittance (U-Factor) shall not be more than:
  1. Sliding Units: U-factor not more than 0.45 BTU/hr/sf/°F per AAMA 507 or NFRC 100 when using project specified glass.
- G. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

- H. Air Infiltration:
  - 1. Tested in accordance with ASTM E283. Air leakage rate shall not exceed .20 cfm/ft<sup>2</sup> at a static air pressure differential of 6.2 psf.
- I. Water Resistance:
  - 1. Tested in accordance with ASTM E547 and ASTM E331. There shall be no leakage as defined in the test method at a static air pressure differential of 20 percent of positive design pressure, but not more than 10 psf.
- J. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503:
  - 1. Kawneer 8400TL: Provide aluminum windows tested for thermal performance according to AAMA 1503, with a CRF not less than 50 (frame) and 61 (glass).
- K. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.
- L. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:
  - 1. 1 inch insulating glass made with (1/4 inch exterior glass with 1/2" airspace and 1/4 inch interior glass): minimum 34(STC) and 29 (OITC).
- M. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F588.
- N. Blast Mitigation Performance: Shall be tested or proven through analysis to meet ASTM F1642/F1642M, GSA TS01, and UFC 4-010-01 performance criteria.
- O. Environmental Product Declarations (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule

## 2.03 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070 inch wall thickness at any location for the main frame and sash members.
- B. Thermal Barrier: The thermal barrier shall consist of integral structural thermal break made with glass-reinforced nylon strips installed continuously and mechanically bonded to the aluminum.
- C. Thermal Barrier:
  - 1. Thermal Barrier: The thermal barrier shall be Kawneer IsoLock™ with a nominal 3/8" (9.53 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.
- D. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

- E. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

#### 2.04 ALUMINUM WINDOWS

- A. Basis-of-Design:
  - 1. Kawneer Company Inc. Series 8400TL Thermal Window - Horizontal Sliding Window units, 4 inch frame depth.
  - 2. Approved equal.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
  - 1. Sliding
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
  - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- D. Glazing
  - 1. Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone back bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gasket in accordance with AAMA 701/702 or ASTM C864.
  - 2. See Section 088000 - GLAZING for additional information.
- E. Insulating-Glass Units: ASTM E2190, certified through IGCC as complying with requirements of IGCC.
  - 1. Glass: ASTM C1036, Type 1, Class 1, q3.
  - 2. Filling: Fill space between glass lites with argon.
  - 3. Low-E Coating: Sputtered on third surface.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
  - 1. Dual Glazing:
    - a. Interior Lite: 1/4" Solargray Glass.
    - b. Exterior Lite: 6mm Clear-0.030" PVB - 6mm Clear Glass with Low-E coating on third surface.
- G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

- H. Hardware: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
1. Horizontal Sliding Window Typical Hardware:
    - a. Continuous Integral Pulls
    - b. Stainless Steel Ball Bearing Rollers
    - c. Stainless Steel Roller Track
    - d. Plunger Lock.

## 2.05 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Exterior Panning and Interior Trims: Extruded aluminum, 6063-T6 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer's standard sealant to assure water-tight joints.
1. Interior Trim: The interior face trim minimum wall thickness shall be 0.062". The face trim shall snap-fit onto concealed mounting clip. The mounting clip shall be extruded aluminum of 6063-T6 alloy and temper. The minimum wall thickness shall be 0.062". The trim clips shall be provided in 4 inch lengths and spaced a maximum of 18" center to center. Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
  2. Exterior Panning and Trim: All panning profiles shall be a minimum thickness of 0.062" to match the profiles as shown the drawings. Extruded-aluminum profiles in sizes and configurations indicated on Drawings. All panning shall be factory fabricated for field assembly. All corner joinery shall be factory cut. Joinery at the sill shall be coped and butt-type construction. All preparations for assembly shall be completed by the window manufacturer. Upon assembly, panning frame joints shall be back-sealed to prevent moisture penetration.
- C. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- D. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- E. Sealants and joint fillers for joints at perimeter of window system as specified in Section 079200 - JOINT SEALANTS.
- F. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- G. Coupling Mullions: Shall be extruded aluminum of 6063-T6 alloy and temper of profile and dimensions indicated on drawings. Mullions shall provide structural properties to resist wind pressure required by performance criteria and standards.

## 2.06 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
1. Frame: 5/16" x 1-1/2" x 0.050 inch extruded tubular aluminum frame with finish to match window in color and performance.

- B. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch diameter, coated aluminum wire; PVC splines.
  - 1. Wire-Fabric Finish: Charcoal gray.

## 2.07 FABRICATION

- A. Framing Members, General: Fabricate windows in sizes indicated that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fit joints; make joints flush, hairline and weatherproof.
  - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  - 4. Physical and thermal isolation of glazing from framing members.
  - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 6. Provisions for field replacement of glazing.
  - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- B. Window Frame Joinery: Mitered and Mechanically clipped and/or staked. Factory sealed frame and corner joints.
- C. Fabricate aluminum windows that are re-glazable without dismantling sash or framing
- D. Thermally Broken Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier. Thermal barriers shall be designed in accordance with AAMA TIR A8.
  - 1. Thermal Barrier: The thermal barrier shall consist of integral structural thermal break made with glass-reinforced nylon strips installed continuously and mechanically bonded to the aluminum.
- E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- F. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093" (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.
- G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
- H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match frame.
- I. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- J. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

- K. Window Assemblies: Provide fixed units in configuration indicated. Provide window frames, sashes, hardware, and other trim and components necessary for a complete, secure, and weathertight installation, including the following:
  - 1. Exterior head and sill casings and trim.
- L. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.08 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.09 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
  - 1. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating Color: As selected by the Architect from manufacturer's full color range.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

### 3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
  - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
  - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
  - 2. Air-Infiltration Testing:
    - a. Test Pressure: That required to determine compliance with AAAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
  - 3. Water-Resistance Testing:
    - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    - b. Allowable Water Infiltration: No water penetration.
  - 4. Test Reports: Prepared according to AAMA 502.
- C. Remove and replace noncomplying windows and retest as specified above.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Prepare test and inspection reports.

### 3.04 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Clean glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.



- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

**END OF SECTION 085113**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Factory fabricated fiberglass/ wood composite windows with fixed and operating sash.
- B. Factory glazed including infill panels.
- C. Operating hardware.
- D. Insect screens.

## 1.02 RELATED REQUIREMENTS

- A. Section 072500 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.
- B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 088000 - Glazing.

## 1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- D. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.
- F. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2019c.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week week before starting work of this section.

## 1.05 SUBMITTALS

- A. See Section 13300 - Submittalsfor submittal procedures.
- B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.

- D. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
  - 1. Evidence of WDMA Certification.
  - 2. Evidence of CSA Certification.
  - 3. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing specified window installations and approved by manufacturer.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

#### 1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).
- B. Maintain this minimum temperature during and after installation of sealants.

#### 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a ten year period after Date of Substantial Completion.
- C. Provide twenty year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.
- D. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.
- E. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Fiberglass / Wood Composite Windows:
  - 1. Marvin Elevate Series - Wood-Fiberglass Composite Windows. as manufactured by Marvin Windows & Doors, Fargo, North Dakota.
  - 2. or approved equal.

## 2.02 WINDOW UNITS

- A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
  - 1. Configuration: As indicated on drawings .
  - 2. Product Type: FW - Fixed window and DH - Double Hung.
  - 3. Color: As selected by architect. Factory baked-on acrylic urethane in accordance with AAMA 624-10.
  - 4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
  - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
  - 6. Thermal Movement: Design to accommodate thermal movement caused by 100 degrees F (34 degrees C) temperature change without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.
- B. Performance Requirements: Provide products that comply with the following:
  - 1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
    - a. Performance Class (PC): LC.
    - b. Performance Grade (PG): 50, with minimum design pressure (DP) of 50.13 psf (2400 Pa).
  - 2. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K).
  - 3. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.
  - 4. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.
  - 5. Air Infiltration: Tested in accordance with ASTM E283. Air leakage rate shall not exceed [.20] cfm/ft2 at a static air pressure differential of 6.2 psf.

## 2.03 COMPONENTS

- A. Frames: 3 1/4 inch (82.55 mm) wide by 1 13/16 inch (46 mm) deep profile; flush glass stops of screw fastened type.
  - 1. Frame Corners: Mitered and joined with nylon corner locks.
  - 2. Interior: Kiln dried (12% maximum at fabrication) clear pine frame interiors with integral water repellent - preservative treated in accordance with ANSI/NWWDA I.S.4.
  - 3. Exterior: Fiberglass reinforced Ultrex, 0.080 inch (2 mm) thick.
  - 4. Frame expander kits with four fabricated frame expander components in 1 and 3 inch size shall be provided.
  - 5. Composite sash thickness: 1 9/16 inch - standard glass.
  - 6. Frame depth: 4 9/16 inch

7. Exterior Finish: Pultruded Fiberglass with factory baked-on acrylic urethane meeting AAMA 624 requirements. Color: Bronze
  8. Interior Stain Finish: [As selected by the Architect from the manufacturer's full color offering.].
- B. Sills: 1 1/4 inch (64 mm) nominal thickness, wood of maple species; sloped for positive wash; fit under sash to 1/2 inch (12 mm) beyond wall face; one piece full width of opening.
- C. Stools: 2 1/2 inch (32 mm) nominal thickness, maple wood as detailed; fit under sash to project 1/2 inch (12 mm) beyond interior wall face; one piece full width of opening.
- D. Grilles: Between-the-glass (GBG):
1. Material: Aluminum.
  2. Size: 11/16 inch (17 mm).
  3. Shape: Contoured.
  4. Exterior Color: Match exterior sash.
  5. Interior color: White or Bronze as selected by the Architect.
  6. Pattern: as indicated on the drawings.
- E. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
1. Frame color: Optional wood veneer
- F. Insect Screens: Woven fiberglass mesh; 18 x 16 mesh size.
1. Color: Charcoal.
- G. Operable Sash Dual (primary and secondary) Weather Stripping: Resilient PVC; permanently resilient, profiled to effect weather seal set into a kerf on all four sides of the Ultrex frame and the sash respectively. Color: Black.
- H. Fasteners: Stainless steel.
- I. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

#### 2.04 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials: As specified in Section 088000 of Types described below:
1. Glass in Exterior Lights: 11/16 inch insulated glass. Select quality complying with ASTM C1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E2190.
  2. Glass Infill Panels: Low E3/ERS with Argon gas type glazing.
  3. Low-E Coating: Sputtered on second or third surface.
  4. Glazing Sealant: Type Silicone bedding on both interior and exterior..
  5. Tint: Grey

#### 2.05 ACCESSORIES AND TRIM

- A. Exterior Casing:
1. Non-integral to the unit – fastened to the exterior wall with barb and kerf.
  2. 2" (51mm) Brick Mould Casing available as a full surround or with sill nosing.
  3. 3 1/2" (89mm) Flat Casing as a full surround or with sill nosing; available with 1" (25mm) ranch style header overhang.
  4. Color: As selected by the Architect.

- B. Mullion Kit: Mullion kit for field assembly of units – Kit includes: Aluminum mull pin, Sealant foam tape, Exterior mullion cover, Interior mull trim, Mull screws, Mull bracket, Mull bracket screws.
- C. Structural mullion kit: structural mullion kit for field assembly of units. Kits includes: instructions, reinforcement member, aluminum pins, wood mullion tie, sealant foam tape, interior mullion trim, #8 x 1 3/4" screws, #7 x 1 5/8" screws, nailing fin connectors and structural brackets.

## 2.06 HARDWARE

- A. Double Hung Sash: Metal and nylon spiral friction slide cylinder, each sash, each jamb.
  - 1. Sash Lock: Self-aligning, cam-action lock.
  - 2. Window Opening Control Device: Provide device to restrict operable sash to less than four inches maximum clear opening and releasable, in compliance with ASTM F2090.
- B. Finish For Exposed Hardware: Match window finish.

## 2.07 FABRICATION

- A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
- B. Form sills and stools in one piece. Slope sills for wash.
- C. Form snap-in glass stops, closure molds, weather stops, and flashings for tight fit into window frame section.
- D. Form weather stop flange to perimeter of unit.
- E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- F. Arrange fasteners to be concealed from view.
- G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- H. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- I. Double weatherstrip operable units with black weatherstripping material.
- J. Factory glaze window units.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

### 3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows in accordance with ASTM E2112.

- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Install sill, stool, and apron.
- F. Set sill members and sill flashing in continuous bead of sealant.
- G. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Install operating hardware.

### 3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 0.5 inches per 100 ft (12 mm/30 m), whichever is less.

### 3.04 FIELD QUALITY CONTROL

- A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and same pressure difference as specified for laboratory tests.
  - 1. Test one window of each type, as directed by Architect/Engineer.
  - 2. If any window fails, test additional windows at Contractor's expense.
- B. Replace windows that have failed field testing and retest until performance is satisfactory.

### 3.05 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

### 3.06 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

**END OF SECTION 085413.11**

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 06 Section "Rough Carpentry".
  - 2. Division 06 Section "Finish Carpentry".
  - 3. Division 08 Section "Hollow Metal Doors and Frames".
  - 4. Division 08 Section "Flush Wood Doors".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series.
  - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies.
  - 3. CAN/ULC-S104 – Standard Method for Fire Tests of Door Assemblies.
  - 4. ANSI/UL 294 – Access Control System Units.
  - 5. ULC-S319 - Electronic Access Control Systems.
  - 6. ULC-60839-11-1, Alarm and Electronic Security Systems - Part 11-1: Electronic Access Control Systems - System and Components Requirements.



7. CAN-ULC-S132 -- Standard Method of Tests for Emergency Exit and Emergency Fire Exit Hardware.
8. CAN-ULC-S533 - Egress Door Securing and Releasing Devices.
9. UL 305 – Panic Hardware.
10. ULC-S132, Emergency Exit and Emergency Fire Exit Hardware.
11. ULC-S533 – Egress Door Securing and Releasing Devices.
12. ANSI/UL 437- Key Locks.
13. ULC-S328, - Burglary Resistant Key Locks.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
  1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
  - b. Complete (risers, point-to-point) access control system block wiring diagrams.
  - c. Wiring instructions for each electronic component scheduled herein.
- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
  - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

- F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
  - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- J. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Five years for exit hardware.
  - 3. Twenty five years for manual overhead door closer bodies.
  - 4. Five years for motorized electric latch retraction exit devices.
  - 5. Two years for electromechanical door hardware.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

## 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

## 2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
  - 1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  - 4. Hinge Options: Comply with the following:
    - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

## 5. Manufacturers:

- a. Bommer Industries (BO).
- b. Hager Companies (HA).
- c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

## 1. Manufacturers:

- a. Bommer Industries (BO).
- b. Hager Companies (HA).
- c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

## 2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

- 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
- 2. Furnish dust proof strikes for bottom bolts.
- 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
- 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

## 5. Manufacturers:

- a. Burns Manufacturing (BU).
- b. Door Controls International (DC).
- c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

## 1. Manufacturers:

- a. Burns Manufacturing (BU).
- b. Door Controls International (DC).
- c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

- 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
- 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.

3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Manufacturers:
  - a. Burns Manufacturing (BU).
  - b. Hiawatha, Inc. (HI).
  - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
  1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  5. Keyway: Match Facility Standard.
- D. Interchangeable Cores: Provide small format interchangeable cores as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
  1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Field verify and key cylinders to match Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
  1. Change Keys per Cylinder: Three (3).
  2. Master Keys (per Master Key Level/Group): Five (5).
  3. Construction Keys (where required): Ten (10).
  4. Construction Control Keys (where required): Two (2).
  5. Permanent Control Keys (where required): Two (2).
- G. Construction Keying: Provide temporary keyed construction cores.
- H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

## 2.5 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
    - a. Lund Equipment (LU).
    - b. MMF Industries (MM).
    - c. Telkee (TK).

## 2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Where specified, provide status indicators with highly reflective color and wording for "locked/unlocked" or "vacant/occupied" with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1" x 0.6" with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.
  2. Manufacturers:
    - a. Corbin Russwin Hardware (RU) – ML2000 Series.
    - b. Sargent Manufacturing (SA) – 8200 Series.
    - c. Schlage (SC) – L9000 Series.

## 2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  3. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:



1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  2. Strikes for Bored Locks and Latches: BHMA A156.2.
  3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  4. Dustproof Strikes: BHMA A156.16.
- C. All doors receiving electronic strikes to receive temp. mechanical door strikes prior to installation of electronic strikes.

## 2.8 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
  4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
  5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
  6. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
  7. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
  8. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

9. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  10. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  11. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  12. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  13. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    - b. Sargent Manufacturing (SA) - 80 Series.
    - c. dormakaba Precision (PR) - Apex 2000 Series.

## 2.9 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
  4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of

use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:
  - a. Corbin Russwin Hardware (RU) – DC8000 Series.
  - b. Norton Door Controls (NO) – 7500 Series.
  - c. Sargent Manufacturing (SA) – 351 Series.

## 2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
  - a. Hiawatha, Inc. (HI).
  - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
  - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
  - a. dormakaba (DO).
  - b. Rixson Door Controls (RF).
  - c. Sargent Manufacturing (SA).

## 2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  - 1. National Guard Products (NG).
  - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
  - 3. Reese Enterprises, Inc. (RE).

## 2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.13 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Section "Closeout Procedures" for project punch and reporting requirements including compliance with approved submittals and verification door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handling and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

- B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood

4. SA - SARGENT
5. BE - dormakaba Best
6. RF - Rixson
7. NO - Norton
8. SU - Securitron
9. OT - Other

**HARDWARE SETS BELOW ARE FOR PHASE 2 FIREHOUSE ONLY****HARDWARE SETS****Set: Type 1**

Doors: 101A, 101B, 107C, 113B, 116B

|   |                             |                                            |       |    |
|---|-----------------------------|--------------------------------------------|-------|----|
| 1 | Continuous Hinge            | BLFM__HD1                                  | BL    | PE |
| 1 | Rim Exit Device             | 8804F ETP BSP 32D                          | US32D | SA |
| 2 | Permanent Cores             | Compatible with Facility's Existing System | 626   | BE |
| 1 | Conc Overhead Stop          | 1-336                                      | 630   | RF |
| 1 | Surface Closer              | J7500 MDA                                  | 626   | NO |
| 1 | Mounting Plate              | As Required                                | 626   | NO |
| 1 | Threshold                   | 2005AT                                     |       | PE |
| 1 | Sweep                       | 18061DNB                                   |       | PE |
| 1 | Kickplate                   | K1125 x 12 inch high                       | US32D | RO |
| 1 | Electronic Strike           | by Security System Supplier                |       | OT |
| 1 | Weatherstrip Set            | S773BL (3 Sides)                           | BL    | PE |
| 1 | ElectroLynx Harness - Frame | by Security System Supplier                |       | OT |
| 1 | ElectroLynx Harness - Door  | by Security System Supplier                |       | OT |
| 1 | Electric Power Transfer     | by Security System Supplier                |       | OT |
| 1 | Wiring Diagram              | by Security System Supplier                |       | OT |
| 1 | Position Switch             | by Security System Supplier                |       | OT |
| 1 | Card Reader                 | by Security System Supplier                |       | OT |
| 1 | Power Supply                | by Security System Supplier                |       | OT |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

**Set: Type 2**

Doors: 107A\*\*, 107B\*\*, 107D\*\* (fire rated), 127 (fire rated), 128 (fire rated)

**AT FIRE RATED DOORS, PROVIDE HARDWARE WHICH COMPLIES WITH REQUIREMENTS IN 1.4F.**

|   |                     |                             |          |
|---|---------------------|-----------------------------|----------|
| 3 | Hinge, Full Mortise | TA2714                      | US26D MK |
| 1 | Passage Latch       | 8215 LP                     | US26D SA |
| 1 | Door Closer         | 7500M (107B,107D, 127, 128) | 626 NO   |
| 1 | Door Closer         | P7500 MDA (105A, 107A)      | 626 NO   |
| 1 | Door Stop           | RM860                       | US26D RO |
| 3 | Silencers           | 608 RKW                     | GRAY RO  |
| 1 | Kickplate           | K1125 x 12 inch high        | US32D RO |
| 1 | Mop Plate           | K1125 x 4 inch high         | US32D RO |
| 1 | Weatherstrip Set    | S773BL (3 Sides)            | BL PE    |

\*\*Denotes doors to receive weatherstripping

**Set: Type 3**

Doors: 115, 119, 204

|   |                             |                                               |          |
|---|-----------------------------|-----------------------------------------------|----------|
| 3 | Hinge, Full Mortise         | TA2714                                        | US26D MK |
| 1 | Mortise Lock<br>(Storeroom) | 8204 LP                                       | US26D SA |
| 1 | Permanent Core              | Compatible with Facility's<br>Existing System | 626 BE   |
| 1 | Conc Overhead Stop          | 1-336                                         | 630 RF   |
| 3 | Silencer                    | 608 RKW                                       | GRAY RO  |
| 1 | Kickplate                   | K1125 x 12 inch high                          | US32D RO |
| 1 | Mop Plate                   | K1125 x 4 inch high                           | US32D RO |

**Set: Type 3A**

Doors: 112B, 114, 116A\*\*, 118A\*\*, 217 (fire rated), 218 (fire rated)

**AT FIRE RATED DOORS, PROVIDE HARDWARE WHICH COMPLIES WITH REQUIREMENTS IN 1.4F.**

|   |                     |                                               |          |
|---|---------------------|-----------------------------------------------|----------|
| 3 | Hinge, Full Mortise | TA2714                                        | US26D MK |
| 1 | Mortise Lock        | 37 8271 LP                                    | US26D SA |
| 1 | Permanent Core      | Compatible with Facility's<br>Existing System | 626 BE   |
| 1 | Conc Overhead Stop  | 1-336                                         | 630 RF   |
| 1 | Door Closer         | 7500MH                                        | 626 NO   |



|   |                                |                                |       |    |
|---|--------------------------------|--------------------------------|-------|----|
| 3 | Silencer                       | 608 RKW                        | GRAY  | RO |
| 1 | Kickplate                      | K1125 x 12 inch high           | US32D | RO |
| 1 | Mop Plate                      | K1125 x 4 inch high            | US32D | RO |
| 1 | Electronic Strike              | by Security System<br>Supplier |       | OT |
| 1 | ElectroLynx Harness<br>- Frame | by Security System<br>Supplier |       | OT |
| 1 | ElectroLynx Harness<br>- Door  | by Security System<br>Supplier |       | OT |
| 1 | Electric Power<br>Transfer     | by Security System<br>Supplier |       | OT |
| 1 | Wiring Diagram                 | by Security System<br>Supplier |       | OT |
| 1 | Position Switch                | by Security System<br>Supplier |       | OT |
| 1 | Card Reader                    | by Security System<br>Supplier |       | OT |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

**\*\*Note:** on Doors 116A and 118A, inside trim to be on corridor side

**Set: Type 3B**

Doors: 104, 111, 220

|   |                          |                                               |       |    |
|---|--------------------------|-----------------------------------------------|-------|----|
| 3 | Hinge, Full Mortise      | TA2714                                        | US26D | MK |
| 1 | Mortise Lock (Storeroom) | 8204 LP                                       | US26D | SA |
| 1 | Permanent Core           | Compatible with Facility's<br>Existing System | 626   | BE |
| 1 | Conc Overhead Stop       | 1-336                                         | 630   | RF |
| 1 | Door Closer              | 7500M                                         | 626   | NO |
| 3 | Silencer                 | 608 RKW                                       | GRAY  | RO |
| 1 | Kickplate                | K1125 x 12 inch high                          | US32D | RO |
| 1 | Mop Plate                | K1125 x 4 inch high                           | US32D | RO |
| 1 | Weatherstrip Set         | S773BL (3 Sides)                              | BL    | PE |

**Set: Type 3C**

Doors: 216, 219

|   |                                |                                               |       |    |
|---|--------------------------------|-----------------------------------------------|-------|----|
| 3 | Hinge, Full Mortise            | TA2714                                        | US26D | MK |
| 1 | Mortise Lock<br>(Storeroom)    | 37 8272 LP                                    | US26D | SA |
| 1 | Permanent Core                 | Compatible with Facility's<br>Existing System | 626   | BE |
| 1 | Door Closer                    | P7500MDA                                      | 626   | NO |
| 3 | Silencer                       | 608 RKW                                       | GRAY  | RO |
| 1 | Kickplate                      | K1125 x 12 inch high                          | US32D | RO |
| 1 | Mop Plate                      | K1125 x 4 inch high                           | US32D | RO |
| 1 | Electronic Strike              | by Security System Supplier                   | OT    |    |
| 1 | ElectroLynx Harness -<br>Frame | by Security System Supplier                   | OT    |    |
| 1 | ElectroLynx Harness -<br>Door  | by Security System Supplier                   | OT    |    |
| 1 | Electric Power Transfer        | by Security System Supplier                   | OT    |    |
| 1 | Wiring Diagram                 | by Security System Supplier                   | OT    |    |
| 1 | Position Switch                | by Security System Supplier                   | OT    |    |
| 1 | Card Reader                    | by Security System Supplier                   | OT    |    |
| 1 | Electronic Strike              | by Security System Supplier                   | OT    |    |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

**Set: Type 4**

Doors: 105\*\*, 108\*\*, 208, 209

|   |                                           |                      |       |    |
|---|-------------------------------------------|----------------------|-------|----|
| 3 | Hinge, Full Mortise                       | TA2714               | US26D | MK |
| 1 | Privacy Bath<br>indicators on one<br>side | V20 8266LP           | US26D | SA |
| 1 | Door Closer                               | 7500M                | 626   | NO |
| 1 | Door Stop                                 | RM860                | US26D | RO |
| 3 | Silencer                                  | 608 RKW              | GRAY  | RO |
| 1 | Kickplate                                 | K1125 x 12 inch high | US32D | RO |
| 1 | Mop Plate                                 | K1125 x 4 inch high  | US32D | RO |
| 1 | Weatherstrip Set                          | S773BL (3 Sides)     | BL    | PE |

\*\* Denotes door to receive weather stripping

**Set: Type 5**

Doors: 203A, 206A, 211, 212, 213, 214, and 215

|   |                                |                                               |          |
|---|--------------------------------|-----------------------------------------------|----------|
| 3 | Hinge, Full Mortise            | TA2714                                        | US26D MK |
| 1 | Mortise Lock<br>(Classroom)    | 8237LP                                        | US26D SA |
| 1 | Permanent Core                 | Compatible with Facility's<br>Existing System | 626 BE   |
| 1 | Door Closer                    | 7500M                                         | 689 NO   |
| 3 | Silencer                       | 608 RKW                                       | GRAY RO  |
| 1 | Kickplate                      | K1125 x 12 inch high                          | US32D RO |
| 1 | Mop Plate                      | K1125 x 4 inch high                           | US32D RO |
| 1 | Door Stop                      | RM860                                         | US26D RO |
| 1 | Electronic Strike              | by Security System Supplier                   | OT       |
| 1 | ElectroLynx Harness -<br>Frame | by Security System Supplier                   | OT       |
| 1 | ElectroLynx Harness -<br>Door  | by Security System Supplier                   | OT       |
| 1 | Electric Power Transfer        | by Security System Supplier                   | OT       |
| 1 | Wiring Diagram                 | by Security System Supplier                   | OT       |
| 1 | Position Switch                | by Security System Supplier                   | OT       |
| 1 | Card Reader                    | by Security System Supplier                   | OT       |
| 1 | Electronic Strike              | by Security System Supplier                   | OT       |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

**Set: Type 5A**

Doors: 102\*\*, 120, 118B, 202, 203B

|   |                             |                                               |          |
|---|-----------------------------|-----------------------------------------------|----------|
| 3 | Hinge, Full Mortise         | TA2714                                        | US26D MK |
| 1 | Mortise Lock<br>(Classroom) | 8237 LP                                       | US26D SA |
| 1 | Permanent Core              | Compatible with Facility's<br>Existing System | 626 BE   |
| 1 | Door Closer                 | 7500M                                         | 689 NO   |
| 3 | Silencer                    | 608 RKW                                       | GRAY RO  |
| 1 | Door Stop                   | RM860                                         | US26D RO |
| 1 | Kickplate                   | K1125 x 12 inch high                          | US32D RO |
| 1 | Mop Plate                   | K1125 x 4 inch high                           | US32D RO |
| 1 | Door Stop                   | RM860                                         | US26D RO |
| 1 | Weatherstrip Set            | S773BL (3 Sides)                              | BL PE    |

\*\*Denotes door to receive weatherstripping

**Set: Type 6**

Doors: 113A, 125A, 201, 210B

**AT FIRE RATED DOORS, PROVIDE HARDWARE WHICH COMPLIES WITH REQUIREMENTS IN 1.4F.**

|   |                     |                                  |          |
|---|---------------------|----------------------------------|----------|
| 3 | Hinge, Full Mortise | TA2714                           | US26D MK |
| 1 | Rim Exit Device     | 8815F ETP 32D                    | US32D SA |
| 1 | Conc Overhead Stop  | 1-336 (at door 125)              | 630 RF   |
| 1 | Surface Closer      | J7500 M                          | 626 NO   |
| 1 | Mounting Plate      | As Required                      | 626 NO   |
| 1 | Kickplate           | K1125 x 12 inch high             | US32D RO |
| 1 | Mop Plate           | K1125 x 4 inch high              | US32D RO |
| 1 | Door Stop           | RM860 (at doors 113A, 201, 210B) | US26D RO |
| 3 | Silencer            | 608 RKW                          | GRAY RO  |

**Set: Type 6A**

Doors: 123, 210A, 206B

|   |                             |                             |          |
|---|-----------------------------|-----------------------------|----------|
| 3 | Hinge, Full Mortise         | TA2714                      | US26D MK |
| 1 | Rim Exit Device             | 8804F ETP 32D               | US32D SA |
| 1 | Conc Overhead Stop          | 1-336                       | 630 RF   |
| 1 | Surface Closer              | J7500 M                     | 626 NO   |
| 1 | Mounting Plate              | As Required                 | 626 NO   |
| 1 | Kickplate                   | K1125 x 12 inch high        | US32D RO |
| 1 | Mop Plate                   | K1125 x 4 inch high         | US32D RO |
| 1 | Electronic Strike           | by Security System Supplier | OT       |
| 1 | ElectroLynx Harness - Frame | by Security System Supplier | OT       |
| 1 | ElectroLynx Harness - Door  | by Security System Supplier | OT       |
| 1 | Electric Power Transfer     | by Security System Supplier | OT       |
| 1 | Wiring Diagram              | by Security System Supplier | OT       |
| 1 | Position Switch             | by Security System Supplier | OT       |
| 1 | Card Reader                 | by Security System Supplier | OT       |
| 1 | Electronic Strike           | by Security System Supplier | OT       |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

**Set: Type 7**

Doors: 103A\*\*, 106\*\*, 109\*\* 121, 117, 205

|   |                          |                                            |       |    |
|---|--------------------------|--------------------------------------------|-------|----|
| 8 | Hinge, Full Mortise      | TA2714                                     | US26D | MK |
| 2 | Flush Bolt               | <a href="#">555</a>                        | US26D | RO |
| 1 | Dust Proof Strike        | <a href="#">570</a>                        | US26D | RO |
| 1 | Mortise Lock (Storeroom) | 8204 LP                                    | US26D | SA |
| 1 | Permanent Core           | Compatible with Facility's Existing System | 626   | BE |
| 1 | Door Closer              | <a href="#">7500 / P7500</a>               | 689   | NO |
| 1 | Conc Overhead Stop       | 1-336                                      | 630   | RF |
| 3 | Silencer                 | 608 RKW                                    | GRAY  | RO |
| 1 | Kickplate                | K1125 x 12 inch high                       | US32D | RO |
| 1 | Mop Plate                | K1125 x 4 inch high                        | US32D | RO |
| 1 | Weatherstrip Set         | S773BL (3 Sides)                           | BL    | PE |

\*\* Denotes door to receive weatherstripping

**Set: Type 7A**

Doors: 103B

|   |                             |                                            |       |    |
|---|-----------------------------|--------------------------------------------|-------|----|
| 2 | Continuous Hinge            | BLFMSLF-HD1 x PT                           | BL    | PE |
| 2 | Flush Bolt                  | <a href="#">555</a>                        | US26D | RO |
| 1 | Dust Proof Strike           | <a href="#">570</a>                        | US26D | RO |
| 1 | Mortise Lock (Storeroom)    | 8204 LP BSP                                | US26D | SA |
| 1 | Permanent Core              | Compatible with Facility's Existing System | 626   | BE |
| 1 | Door Closer                 | <a href="#">7500 / P7500</a>               | 689   | NO |
| 1 | Conc Overhead Stop          | 1-336                                      | 630   | RF |
| 3 | Silencer                    | 608 RKW                                    | GRAY  | RO |
| 1 | Kickplate                   | K1125 x 12 inch high                       | US32D | RO |
| 1 | Weatherstrip Set            | S773BL (3 Sides)                           | BL    | PE |
| 1 | Threshold                   | 2005AT                                     |       | PE |
| 1 | Sweep                       | 18061DNB                                   |       | PE |
| 1 | Electronic Strike           | by Security System Supplier                |       | OT |
| 1 | ElectroLynx Harness - Frame | by Security System Supplier                |       | OT |
| 1 | ElectroLynx Harness - Door  | by Security System Supplier                |       | OT |
| 1 | Electric Power Transfer     | by Security System Supplier                |       | OT |
| 1 | Wiring Diagram              | by Security System Supplier                |       | OT |
| 1 | Position Switch             | by Security System Supplier                |       | OT |
| 1 | Card Reader                 | by Security System Supplier                |       | OT |
| 1 | Electronic Strike           | by Security System Supplier                |       | OT |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

**Set: Type 7B**

Doors: 101C\*\* (fire rated)

**AT FIRE RATED DOORS, PROVIDE HARDWARE WHICH COMPLIES WITH REQUIREMENTS IN 1.4F.**

|   |                        |                                            |       |    |
|---|------------------------|--------------------------------------------|-------|----|
| 8 | Hinge, Full Mortise    | TA2714                                     | US26D | MK |
| 2 | Flush Bolt             | 555                                        | US26D | RO |
| 1 | Dust Proof Strike      | 570                                        | US26D | RO |
| 1 | Mortise Lock (Passage) | 8215 LP                                    | US26D | SA |
| 1 | Permanent Core         | Compatible with Facility's Existing System | 626   | BE |
| 1 | Door Closer            | 7500 / P7500                               | 689   | NO |
| 1 | Conc Overhead Stop     | 1-336                                      | 630   | RF |
| 3 | Silencer               | 608 RKW                                    | GRAY  | RO |
| 1 | Kickplate              | K1125 x 12 inch high                       | US32D | RO |
| 1 | Mop Plate              | K1125 x 4 inch high                        | US32D | RO |
| 1 | Weatherstrip Set       | S773BL (3 Sides)                           | BL    | PE |

\*\* Denotes door to receive weatherstripping

**Set: Type 8**

Doors: 122

**\*\* AT FIRE RATED DOORS, PROVIDE HARDWARE WHICH COMPLIES WITH REQUIREMENTS IN 1.4F.**

|   |                          |                                            |       |    |
|---|--------------------------|--------------------------------------------|-------|----|
| 3 | Hinge, Full Mortise      | TA2714                                     | US26D | MK |
| 1 | Mortise Lock (Storeroom) | 8204 LP                                    | US26D | SA |
| 1 | Permanent Core           | Compatible with Facility's Existing System | 626   | BE |
| 1 | Door Closer              | P7500DA                                    | 626   | NO |
| 3 | Silencer                 | 608 RKW                                    | GRAY  | RO |
| 1 | Kickplate                | K1125 x 12 inch high                       | US32D | RO |
| 1 | Mop Plate                | K1125 x 4 inch high                        | US32D | RO |

**Set: Type 9**

Doors: 125B

|   |                          |                                     |       |    |
|---|--------------------------|-------------------------------------|-------|----|
| 6 | Hinge, Full Mortise      | TA2714                              | US26D | MK |
| 2 | Flush Bolt               | 555                                 | US26D | RO |
| 1 | Dust Proof Strike        | 570                                 | US26D | RO |
| 1 | Mortise Lock (Storeroom) | 8204 LP                             | US32D | SA |
| 1 | Dummy Trim               | 8215 LP                             | US32D | SA |
| 1 | Permanent Core           | Compatible with Facility's Existing | 626   | BE |

|   |                         | System              |       |    |
|---|-------------------------|---------------------|-------|----|
| 2 | Concealed Overhead Stop | 1-336               | 630   | RF |
| 2 | Mop Plate               | K1125 x 4 inch high | US32D | RO |
| 2 | Silencer                | 608 RKW             | GRAY  | RO |

**Set: Type 10**

Doors: 116C

\*\* AT FIRE RATED DOORS, PROVIDE HARDWARE WHICH COMPLIES WITH REQUIREMENTS IN 1.4F.

|   |                           |                      |       |    |
|---|---------------------------|----------------------|-------|----|
| 6 | Hinge, Full Mortise       | TA2714               | US15  | MK |
| 2 | Concealed Rim Exit Device | 12- 8837F ETP 32D    | US32D | SA |
| 2 | Door Closer               | 7500M                | 689   | NO |
| 2 | Door Stop                 | RM850 / RM860        | US26D | RO |
| 1 | Gasketing                 | S773BL               |       | PE |
| 1 | Astragal                  | S772BL               |       | PE |
| 1 | Kickplate                 | K1125 x 12 inch high | US32D | RO |
| 1 | Mop Plate                 | K1125 x 4 inch high  | US32D | RO |

**Set: Type 11**

Doors: 126A

|   |                                |                                            |       |    |
|---|--------------------------------|--------------------------------------------|-------|----|
| 2 | Continuous Hinge               | BLFMSLF-HD1 x PT                           | D     | PE |
| 1 | Concealed Vert Rod Exit        | EL-3347A-NL-LBL                            | SPBLK | VD |
| 1 | Concealed Vert Rod Exit, Dummy | EL-3347A –DT-LBL                           | SPBLK | VD |
| 3 | Permanent Core                 | Compatible with Facility's Existing System | 626   | BE |
| 2 | Conc Overhead Stop             | 1-336                                      | 630   | RF |
| 2 | Surface Closer                 | J7500 MDA                                  | 689   | NO |
| 2 | Mounting Plate                 | As Required                                | 689   | NO |
| 1 | Electronic Strike              | by Security System Supplier                |       | OT |
| 2 | Weatherstrip Set               | S773BL (3 Sides)                           | BL    | PE |
| 1 | Threshold                      | 2005AT                                     |       | PE |
| 1 | Sweep                          | 18061DNB                                   |       | PE |
| 1 | ElectroLynx Harness - Frame    | by Security System Supplier                |       | OT |
| 1 | ElectroLynx Harness - Door     | by Security System Supplier                |       | OT |
| 1 | Electric Power Transfer        | by Security System Supplier                |       | OT |
| 1 | Wiring Diagram                 | by Security System Supplier                |       | OT |
| 1 | Position Switch                | by Security System Supplier                |       | OT |
| 1 | Card Reader                    | by Security System Supplier                |       | OT |
| 1 | Power Supply                   | by Security System Supplier                |       | OT |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Owner shall have ability to dictate when doors can remain unlocked without valid credentials. Operating inside trim allows

egress at all times. With loss of power door remains locked.

**Set: Type 11A**

Doors: 126B

|                                  |                  |       |    |
|----------------------------------|------------------|-------|----|
| 2 Continuous Hinge               | BLFMSLF-HD1 x PT | D     | PE |
| 1 Concealed Vert Rod Exit, Dummy | 3347A-DT-LBL     | SPBLK | VD |
| 1 Concealed Vert Rod Exit, Dummy | 3347A –DT-LBL    | SPBLK | VD |
| 2 Conc Overhead Stop             | 1-336            | 630   | RF |
| 2 Surface Closer                 | J7500 MDA        | BSP   | NO |
| 2 Mounting Plate                 | As Required      | 689   | NO |
| 2 Weatherstrip Set               | S773BL (3 Sides) | BL    | PE |
| 1 Threshold                      | 2005AT           |       | PE |

**Set: Type 12**

Doors: 207A

|                               |                                            |       |    |
|-------------------------------|--------------------------------------------|-------|----|
| 6 Hinge, Full Mortise         | TA2714                                     | US15  | MK |
| 2 Mortise Lock (Classroom)    | 8237 LP                                    | US26D | SA |
| 3 Permanent Core              | Compatible with Facility's Existing System | 626   | BE |
| 2 Conc Overhead Stop          | 1-336                                      | 630   | RF |
| 2 Surface Closer              | J7500 MDA                                  | BSP   | NO |
| 2 Mounting Plate              | As Required                                | 689   | NO |
| 1 Electronic Strike           | by Security System Supplier                |       | OT |
| 1 ElectroLynx Harness - Frame | by Security System Supplier                |       | OT |
| 1 ElectroLynx Harness - Door  | by Security System Supplier                |       | OT |
| 1 Electric Power Transfer     | by Security System Supplier                |       | OT |
| 1 Wiring Diagram              | by Security System Supplier                |       | OT |
| 1 Position Switch             | by Security System Supplier                |       | OT |
| 1 Card Reader                 | by Security System Supplier                |       | OT |
| 1 Power Supply                | by Security System Supplier                |       | OT |
| 2 Flush Bolt                  | 555                                        | US26D | RO |
| 1 Dust Proof Strike           | 570                                        | US26D | RO |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information.

**Set: Type 13**

Doors: 207B

|                            |         |       |    |
|----------------------------|---------|-------|----|
| 3 Hinge, Full Mortise      | TA2714  | US15  | MK |
| 1 Mortise Lock (Classroom) | 8237 LP | US26D | SA |



|                               |                                            |     |    |
|-------------------------------|--------------------------------------------|-----|----|
| 1 Permanent Core              | Compatible with Facility's Existing System | 626 | BE |
| 1 Conc Overhead Stop          | 1-336                                      | 630 | RF |
| 1 Surface Closer              | J7500 MDA                                  | 689 | NO |
| 1 Mounting Plate              | As Required                                | 689 | NO |
| 1 Electronic Strike           | by Security System Supplier                |     | OT |
| 1 ElectroLynx Harness - Frame | by Security System Supplier                |     | OT |
| 1 ElectroLynx Harness - Door  | by Security System Supplier                |     | OT |
| 1 Electric Power Transfer     | by Security System Supplier                |     | OT |
| 1 Wiring Diagram              | by Security System Supplier                |     | OT |
| 1 Position Switch             | by Security System Supplier                |     | OT |
| 1 Card Reader                 | by Security System Supplier                |     | OT |
| 1 Power Supply                | by Security System Supplier                |     | OT |

**Set: Type 14**

Doors: 105B, 112A

|                            |                                            |       |    |
|----------------------------|--------------------------------------------|-------|----|
| 1 Continuous Hinge         | BLFMSLF-HD1 x PT                           | BL    | PE |
| 1 Mortise Lock (Storeroom) | 8204 LP                                    | US26D | SA |
| 1 Permanent Core           | Compatible with Facility's Existing System | 626   | BE |
| 1 Conc Overhead Stop       | 1-336                                      | 630   | RF |
| 1 Surface Closer           | J7500 MDA                                  | 689   | NO |
| 1 Mounting Plate           | As Required                                | 689   | NO |
| 1 Weatherstrip Set         | S773BL (3 Sides)                           | BL    | PE |
| 1 Threshold                | 2005AT                                     |       | PE |
| 1 Sweep                    | 18061DNB                                   |       | PE |
| 1 Kickplate                | K1125 x 12 inch high                       | US32D | RO |

**Set: Type 15**

Doors: 211, 212, 213, 214, and 215

|   |                          |                                            |       |    |
|---|--------------------------|--------------------------------------------|-------|----|
| 3 | Hinge, Full Mortise      | TA2714                                     | US26D | MK |
| 1 | Mortise Lock (Classroom) | 8205 LP                                    | US26D | SA |
| 1 | Permanent Core           | Compatible with Facility's Existing System | 626   | BE |
| 1 | Door Closer              | 7500M                                      | 689   | NO |
| 3 | Silencer                 | 608 RKW                                    | GRAY  | RO |
| 1 | Kickplate                | K1125 x 12 inch high                       | US32D | RO |
| 1 | Mop Plate                | K1125 x 4 inch high                        | US32D | RO |
| 1 | Door Stop                | RM860                                      | US26D | RO |

|   |                                |                             |    |
|---|--------------------------------|-----------------------------|----|
| 1 | Electronic Strike              | by Security System Supplier | OT |
| 1 | ElectroLynx Harness -<br>Frame | by Security System Supplier | OT |
| 1 | ElectroLynx Harness -<br>Door  | by Security System Supplier | OT |
| 1 | Electric Power Transfer        | by Security System Supplier | OT |
| 1 | Wiring Diagram                 | by Security System Supplier | OT |
| 1 | Position Switch                | by Security System Supplier | OT |
| 1 | Card Reader                    | by Security System Supplier | OT |
| 1 | Electronic Strike              | by Security System Supplier | OT |

Notes: The contractor shall prep all door frames on this hardware set to receive electronic door strikes, coordinate with the owner's security system supplier for manufacturer information. Additionally, the contractor shall provide manual door strikes as recommended by the door hardware manufacturer.

Notes: Balance of hardware by assembly supplier.

**END OF SECTION**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Window Units. (Refer to Window Specification)
  - 2. Vision Lites.
  - 3. Exterior Doors, Transoms and Side Lites.
  - 4. Interior Doors, Transoms and Side Lites.
  - 5. Mirrors
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 081113 - Hollow Metal Doors and Frames
  - 2. Section 081429 - Prefinished Wood Doors
  - 3. Section 083613 - Sectional Overhead Doors
  - 4. Section 084113 - Aluminum Framed Entrances and Storefronts
  - 5. Section 085113 - Aluminum Windows

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations. Refer to the below referenced publications (latest edition) for glazing terms not otherwise defined in this section.
- B. AAMA A804.1 "Voluntary Specification for Ductile Back-Bedding Compound" (mandatory).
- C. AAMA A807.1 "Voluntary Specification for Oil-Extended Cured Rubber Back-Bedding Glazing Tapes" (mandatory).
- D. ANSI Z97.1 "American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test".
- E. ASTM C162 "Standard Terminology of Glass and Glass Products".
- F. ASTM C509 "Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material".
- G. ASTM C864 "Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers".
- H. ASTM C920 "Standard Specification for Elastomeric Joint Sealants".
- I. ASTM C1036 "Standard Specification for Flat Glass".
- J. ASTM C1048 "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass".
- K. ASTM E1300 "Standard Practice for Determining Load Resistance of Glass in Buildings".
- L. CPSC "16CFR1201, Safety Standard for Architectural Glazing Materials".

- M. FGMA (Flat Glass Manufacturers Association) "Glazing Manual".
- N. AAMA Recommendations and Guidelines.
- O. NFRC (National Fenestration Rating Council) 100 "Procedure for Determining Fenestration Product U-Factors"
- P. NFRC 200 "Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence".
- Q. NFRC 300 "Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems".

#### 1.04 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.
- D. Sealed Insulating Glass Unit Surface Designations:
  - 1. Surface #1 - Exterior surface of the outer glass lite.
  - 2. Surface #2 - Interspace surface of the outer glass lite.
  - 3. Surface #3 - Interspace surface of the inner glass lite.
  - 4. Surface #4 - Interior surface of the inner glass lite or the interlayer surface of the first layer of laminated glass.
  - 5. Surface #5 - Interlayer surface of the second layer of laminated glass.
  - 6. Surface #6 - Interior surface of the second layer of laminated glass.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E1300 by a qualified professional engineer licensed in the State of the project, using the following design criteria:
  - 1. Design Wind Pressure: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Contract Drawings.
    - a. Wind Design Data: As indicated on Contract Drawings.
    - b. Basic Wind Speed : 120 mph.
    - c. Importance Factor: III.
    - d. Seismic Zone: As indicated on Contract Drawings.
  - 2. Design Snow Loads: As indicated on Contract Drawings.
  - 3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or one (1) inch, whichever is less.
  - 4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short duration load.
  - 5. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of glass.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
  - 1. Temperature Change: 120 degree F, ambient; 180 degree F, material surfaces.
  - 2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

#### 1.06 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements
- C. Product data: Description of each type of glass, glazing product, and accessory product.
- D. Samples: Provide 12" x 12" samples of all tinted glass and other glass only if requested by Architect.
- E. Product Certificates:
  - 1. Statement that wired glass provided for fire rated doors meets labeling or certification requirements of public authorities.
  - 2. Statement that the extent of tempered glass meets requirements of public authorities.
- F. Maintenance data for glass and other glazing materials to be included in Operating and Maintenance Manual specified in Division 01 including GANA Mirror Information Bulletin entitled *Proper Procedures for Cleaning Flat Glass Mirrors*.

#### 1.07 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.
- B. Qualifications of installer: Provide glazing work by an installer who has installed the specified products for at least 2 years.
- C. Single-Source Responsibility for Glass and Glazing Accessories: Obtain glass and accessories from one source for each product indicated.
- D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
  - 1. Insulating Glass Certification Council (IGCC).
  - 2. Associated Laboratories, Inc. (ALI).
  - 3. National Certified Testing Laboratories (NCTL).
- E. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
  - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- F. Fire-Protection Rated Glazing Labeling: Permanently mark fire-protection rated glazing with certification label of testing agency acceptable to authorities having jurisdiction. Label shall indicate the following:
  - 1. Manufacturer
  - 2. Test Standard

3. Whether glazing is for use in fire doors
4. Hose-stream test
5. Temperature rise rating
6. Fire -resistance rating in minutes

#### 1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Package, handle, and store glass and mirrors so that water does not touch or condense on glass surfaces or mirror edges.
- D. Protect glass edges against chipping and other damage. Protect coated glass surfaces from abrasion and scratching.
- E. Store glass and glazing products in controlled environment, out of sunlight, so that temperature does not go above 80° F. Bring glazing materials to at least 40° F, or higher temperature if recommended by producer, before installing.
- F. Furnish labels identifying each type of glass. Keep labels in place until glass is installed.

#### 1.09 WARRANTY

- A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in "Definitions" article f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.
  1. Warranty Period: Manufacturer's standard, but not less than ten (10) years after date of Substantial Completion.
- C. Manufacturer's Warranty on Coated Glass Products: Submit written warranty signed by manufacturer of coated glass agreeing to furnish replacements for those coated glass units that deteriorate as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.
  1. Warranty Period: Manufacturer's standard, but not less than ten (10) years after date of Substantial Completion.
- D. Manufacturer's Warranty on Laminated Glass: Submit written warranty signed by manufacturer of laminated glass agreeing to furnish replacements for those laminated glass units that deteriorate within specified warranty period. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard, but not less than ten (10) years after date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 GLAZING PERFORMANCE REQUIREMENTS

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
  1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with Performance Requirements. Where fully tempered glass is indicated or required, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed in Btu/sq.ft. x h x deg F (W/sq. m x K).
  5. Solar Heat Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

### 2.02 GLASS PRODUCTS

- A. Pyrolytic-Coated, Self-Cleaning, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.
  1. Products: Subject to compliance requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cardinal Glass Industries: Neat™
    - b. Pilkington North America Activ™
    - c. PPG Industries, Inc.: SunClean®
- B. Tinted Float Glass: Class 2, complying with other requirements specified.
  1. Basis of Design Product: Subject to compliance with requirements, provide Solargray by PPG Industries or comparable product by one of the following:
    - a. Guardian Industries
    - b. Oldcastle BuildingEnvelope®
  2. Tint Color: Grey
  3. Visible Light Transmittance: 76 for Clear glazing and 54 for Gray Tinted glazing percent minimum.

### 2.03 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category 11 materials, and with other requirements specified. Use materials that have proven record of no tendency to bubble, discolor, or loose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
  2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements
  3. Interlayer Color: Clear unless otherwise indicated.
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

#### 2.04 INSULATING GLASS

- A. Insulating-Glass Units: Factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
  2. Spacer: Manufacturer's standard aluminum spacer material and construction.
  3. Desiccant: Molecular sieve or silica gel, or blend of both.
  4. Interspace Content: Argon

#### 2.05 FIRE-PROTECTION-RATED GLAZING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire rated glass products that may be incorporated in the Work include, but are not limited to, the following:
1. SAFTI FIRST, 100 N. Hill Dr., Suite 12, Brisbane, CA 94005. Phone: 888-653-3333 (Basis of Specification).
  2. Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 Phone: 800-426-0279.
  3. Architect Approved Equivalent.
- B. Material:
1. SuperClear 45-HS-LI 45 minute fire and safety rated glazing.
  2. GP Firelite Plus®
- C. Design Requirements:
1. Thickness:  $\frac{3}{4}$ " standard.
  2. Weight: 9 lbs./sq.ft.
  3. Sound Transmission Rating: Must meet 37 STC/35 OITC in standard hollow metal frames. Glass and frame must be tested as an assembly. Glass only STC/OITC values are not acceptable.
  4. Appearance: clear, wireless and tint-free.
  5. Visual Light Transmission: Must meet 90% VLT for low-iron.
  6. Fire Rating: 45 minutes with hose stream.
  7. Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Category I and II, ANSI Z91.1 Class A and B and CAN/CGSB 12.1 Class A and B.
- D. Manufacturer's Fire Rated Glazing Material:
1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
  2. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80:
    - a. CPSC 16 CFR 1201, Cat. I or II.



## E. Mirrors

1. Description: Float glass with 4-layer reflective coating system on back, consisting of chemically deposited silver, electrically or chemically deposited copper, a paint coat, and a protective organic coating. Cut mirrors to size after coating. Treat and seal mirror edges in shop immediately after cutting to final size.
2. Thickness: 6.0 mm, or 1/4 in. nominal.
3. Color: Clear.
4. Tempering: Fully temper mirrors in locations required by 16CFR1201 and public authorities. Otherwise, provide non-tempered mirror glass.
5. Glass Quality: Mirror.
- 6.

## 2.06 GLAZING MATERIALS

- A. Description: Provide glazing materials that are compatible with one another and with materials of glazing channel as well as with any sealants or interlayers in the glass units.
1. Product quality assurance: Confirm compatibility of all products used or encountered in executing the work of this Section. Test as necessary to assure short and long term performance of frames, glazing materials, and glass without loss of seal, gassing, staining, discoloration, softening, deterioration, racking, breaking, or leaking.
  2. Color: Provide glazing materials, which match color of glazing channel. If color match is not available, submit color samples to Architect for color selection.

## 2.07 PREFORMED TAPE WET GLAZING

- A. Description: 100% solids, extruded, non-staining butyl-isobutylene tape. Provide hard spacer rod for use in lights over 80 united in.
- B. Standards:
1. AAMA A804.1, for normal use.
  2. AAMA A807.1, for use where much thermal movement is anticipated.

## 2.08 COMPRESSION GASKET AND PREFORMED GASKET DRY GLAZING

- A. Description: Chloroprene (neoprene), EPDM, or silicone compression gaskets in a soft and a dense formulation for the two sides of the glass. Select soft gasket to compress 25 to 40% when glass and dense gasket are in place.
1. Where small lites (as in doors) can be glazed with a continuous preformed elastomeric glazing extrusion, use a gasket of the dense formulation, compressed to watertightness outside and inside, with either a bent joint or a tightly compressed cut joint at corners.
- B. Standards:
1. Soft gaskets: ASTM C509.
  2. Dense gaskets: ASTM C864.

## 2.09 GLAZING ACCESSORIES

- A. Setting blocks, edge blocks, spacers, and gaskets: Chloroprene (neoprene), EPDM, or silicone: ASTM C864.
1. Hardness of setting blocks: Sufficient to compress no more than 20% under weight of glass.
- B. Cleaners, solvents: As recommended by glazing material producer for each type of glass, glazing material, and substrate.

## PART 3 EXECUTION

## 3.01 PREPARATION

- A. Examine frames and other construction, which supports or underlies glazing work. Where frames are out of square, out of plane, subject to excessive deflection, or where substrates contain bond breaking substances, moisture, unsound material, or where there are other conditions unsuitable for proper installation or performance of the glazing work, do not start glazing work until defective earlier construction has been completed or corrected.
- B. For exterior glazing, do not start glazing until each lite is provided with 2 or more weepholes, not more than 3 ft o.c.
- C. Remove dust and other bond breaking substances from surfaces to be glazed. Do not glaze wet, damp, or uncured surfaces.

## 3.02 INSTALLATION

- A. Installation includes such work as surface preparation, priming, cleaning, protecting, and repairing or replacing defective and damaged work.
- B. Provide safety glass in lites where required by 16CFR1201 and public authorities, and at other locations as specified herein.
- C. Install glazing according to FGMA Glazing Manual.
- D. Orient glass so that wave and other distortions run horizontally.
- E. Install glass and glazing materials only when the temperatures of air, materials, and substrate are above 40 F. If air temperature is below 40 F, protect the and bring glazing materials to temperature recommended by producer.
- F. Install wired glass in fire rated door vision lites and fire rated windows using sealant approved by the fire rating agency for use with the tested assembly.
- G. Mount mirrors using clip fasteners in such a way that the mirror is a plane, without distortion of image, and so that at least 3/16 in. is left for air circulation behind mirror. Apply adhesives in a straight line with beads running vertically to allow proper air flow. Keep backs and edges of mirrors free of water. Clean and polish mirrors by methods that will not harm surface or backing.
- H. At fixed lites which extend within 18 in. of floor, place permanent decals 54 in. off floor, 24 in. o.c. maximum, but not closer than 12 in. edge-to-edge. At doors with lites which extend within 18 in. of floor, place one decal 54 in. off floor, in center of lite width.

## 3.03 PROTECTION

- A. Identify glazed areas by hanging narrow streamers from walls and mullions. Do not mark glass nor affix decals to glass.
- B. Clean installed glass frequently during construction. Do not place other materials in contact with glass nor in such a way as to create a heat trap.
- C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

- D. Wash glass on both faces in each area of project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

### 3.04 GLAZING SCHEDULE EXTERIOR

- A. Aluminum Entrance Doors
1. 1" Lo E3 366 insulated glass.
  2. Temper: all lites
  3. Provide between the glass muntins. Color and profile to match window muntins.
  4. Color:
    - a. Interior glazing: Clear
    - b. Exterior Glazing: Grey
  5. Type: Plain
  6. Glazing method: Gasket
- B. Windows
1. 1" Lo E3 366 insulated glass.
  2. Temper: all lites within 18" of doors or floor.
  3. Provide between the glass muntins.
  4. Color:
    - a. Interior glazing: Clear
    - b. Exterior Glazing: Grey
  5. Type: Plain
  6. Glazing method: Gasket
- C. Hollow Metal Entrance Doors
1. 1/4" Lo E3 366 insulated glass.
  2. Temper: all lites.
  3. Provide between the glass muntins. Color and profile to match window muntins.
  4. Color:
    - a. Glazing: Grey
  5. Type: Plain
  6. Glazing method: Tape or gasket for lites smaller than 5 sq. ft.

### 3.05 GLAZING SCHEDULE INTERIOR

- A. Aluminum Framed Doors
1. Thickness: 1/4"
  2. Temper: Lites
  3. Color: Clear
  4. Type: Plain
  5. Glazing method: Gasket
- B. Fire Rated Doors
1. Thickness: 1/4"
  2. Color: Clear
  3. Type: Firelite
  4. Glazing Method: Fire rated gasket

**END OF SECTION 088000**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Provide Louvers and all associated louver accessories and components in accordance with the Contract Documents and as required to provide a complete and first class installation. The work of this section shall include, but not be limited to the following:
  - 1. Drainable stationary blade hurricane louver.
  - 2. Bird and insect screening.
  - 3. Motorized dampers.

## 1.02 RELATED SECTIONS

- A. Caulking and Sealants: Section 079200.
- B. Mechanical: Division 23.

## 1.03 REFERENCES

- A. AMCA 500-L (Air Movement Control Association) - Test Method for Louvers.
- B. AMCA 540 - Test Method for Louvers Impacted by Wind Borne Debris.
- C. ASTM B221 – Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
- D. SMACNA – Architectural Sheet Metal Manual.

## 1.04 PERFORMANCE REQUIREMENTS

- A. Design and fabricate units to withstand wind lateral loads and snow loads.

## 1.05 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens and frames.
- C. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- D. Samples: Submit two (2) samples, 2" x 2" in size illustrating finish and color of exterior and interior surfaces.
- E. Submit two samples of manufacturer's full line of powder coating color chips. Color to be selected by Owner.
- F. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
- G. Equals will only be accepted if they meet or exceed the performance of specified louvers.

## 1.06 QUALITY ASSURANCE

- A. Perform work in accordance with AMCA Certification for louvers and dampers.

### 1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings and instructed by the manufacturer.

### 1.08 COORDINATION

- A. Coordinate the Work with installation of flashings.
- B. Coordinate the Work with installation of mechanical ductwork.

## PART 2 - PRODUCTS

### 2.01 ACCESSORIES

- A. Fasteners and Anchors: Stainless steel type.
- B. Head and Sill Flashings: Roll formed to required shape, single length in one piece per location. Flashings: Of same material as louver frame.
- C. Screens: Install screen mesh in shaped frame, reinforce corner construction, shop install to louver with fasteners. Screen shall be easily removed from the building interior.
- D. Sealants: Type specified in Section 079200.

### 2.02 DRAINABLE STATIONARY BLADE HURRICANE LOUVER

- A. Louvers shall be stationary blade type with 45° dual drainable blades spaced approximately 4-inches on centers. Louvers shall be approximately 4-inches deep.
- B. Louvers shall be designed in accordance with and meet the requirements of High Velocity Hurricane Zones and be Miami-Dade certified.
- C. Louvers shall be provided with an aluminum insect screen.
- D. Frame Material: 0.125-inch thick (nominal) extruded aluminum 6063-T52 alloy.
- E. Blade Material: 0.125-inch thick (nominal) extruded aluminum 6063-T52 alloy.
- F. Blade Type: Horizontal, dual drainable.
- G. Face of Louver: Full width sill with head and blades contained within jambs. Welded construction.
- H. Pressure Tolerance: +/- 150 PSF
- I. Louver finish shall be Kynar, color as selected by Owner.
- J. Louvers shall be Type EA-22 as manufactured by Arrow United Industries or approved equal.

### 2.03 DAMPERS

- A. Dampers shall be arrow-foil parallel blade type constructed of extruded aluminum. Low leakage damper shall bear the AMCA Certified Ratings Seal for air leakage and air performance. Leakage through a 60"x36" damper at 4" water gauge pressure differential shall be equal to Class I leakage.

- B. Frames and blades to be a minimum 12 ga (.081") extruded aluminum. Blades to be a single unit arrow-foil design, 6" wide with the pin-lock an integral section within the blade core.
- C. Blades shall have extruded silicone rubber seal at blade edge. A blade overlap shall be present when damper is in the closed position. Silicone seals shall fit into ribbed groove insert in blades with a formed stainless steel, spring steel seal at the jamb.
- D. Frames shall be extruded aluminum channel with reinforcing bosses and groove inserts for silicone seals.
- E. Axle shafts to be 1/2" diameter extruded aluminum, pin-lock design interlocking into blade section. Axle bearings shall be designed so that there is no metal-to-metal or metal-to-bearing riding surfaces.
- F. Linkage shall be contained within the jamb of the damper frame. Damper frame shall have extruded aluminum stops at the top and bottom.
- G. A complete damper assembly shall have blades no wider than 60 inches and no higher than 72 inches. Where required damper width or height exceeds manufacturer's maximum recommended single panel size, the assembly shall be made of a combination of sections. Dampers shall be sized for the scheduled air velocity and pressure classification.
- H. Louvers shall be Arrow-Foil Damper Model AFD-20 as Manufactured by Arrow United Industries or approved equal.

#### 2.04 MOTORIZED DAMPER ACTUATORS

- A. Fast-acting, two-position actuators shall be of the power open, spring return direct coupled type for on/off damper control.
- B. Actuator shall fail normally closed.
- C. Die-cast aluminum housing shall allow for flush mounting to damper.
- D. Timing at rated torque and voltage:
  - 1. Drive Open: 15 seconds
  - 2. Spring Close: 15 seconds
- E. Motorized actuators shall be Model MS4120F1006 as Manufactured by Honeywell or approved equal.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.

#### 3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Install flashings and align assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

- D. Secure louvers in opening framing with concealed fasteners.
- E. Install screens and frame to interior of louver where indicated.
- F. Install perimeter sealant and backing rod in accordance with Section 079200.
- G. Install motorized damper in accordance with manufacturer's instructions.
- H. Provide and locate louvers per contract drawings.
- I. Provide automatic control dampers with motors at louver locations as called for on contract drawings.
- J. Blank off and seal any sections of louvers not covered by the ductwork.

### 3.03 ADJUSTING AND CLEANING

- A. Adjust work under provisions of Section 017500.
- B. Clean work under provisions of 017423.
- C. Test operable louvers and adjust as needed to produce fully functioning units that comply with the requirements.
- D. Clean exposed louver surfaces that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- E. Before final inspection, clean exposed surfaces in accordance with manufacturer's directions.
- F. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Engineer, remove damaged units and replace with new units.
- G. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

### END OF SECTION 089119

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Pre-formed moisture suppression membrane installed over concrete subfloor as a floor covering underlayment.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 033000 - Cast-In-Place Concrete
  - 2. Section 093000 - Ceramic Tile (Thick- Set)
  - 3. Section 093013 - Ceramic Tiling
  - 4. Section 096519.23 - Luxury Vinyl Tile

## 1.03 REFERENCES

- A. Referenced Standards: These standards (latest edition or edition in force by AHJ) form part of this specification only to the extent they are referenced as specification requirements.
  - 1. ASTM International (ASTM):
    - a. ASTM D2646 - "Standard Guide for Backing Fabric Characteristics of Pile Yarn Floor Coverings".
    - b. ASTM G21 - "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi".
    - c. ASTM D5197 - "Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology)".
    - d. ASTM E96 - "Standard Test Methods for Water Vapor Transmission of Materials".
    - e. ASTM E648 - "Standard Test method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source".
    - f. ASTM E662 - "Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials."
    - g. ASTM F710 - "Standard Practice Preparing Concrete Floors to Receive Resilient Flooring".
    - h. ASTM F2170 - "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes".

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Product Data: Manufacturer's data indicating product physical characteristics, performance criteria, and limitations of use, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods and instructions.
  - 4. Two sided and seam tape product data.
  - 5. Patching and leveling compound product data.
- D. Warranty Registration: Manufacturer's warranty registration with concrete subfloor moisture test results and building ambient air temperature and relative humidity test results.



### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Acceptable to manufacturer, experienced in performing work of this section and specialized in work similar to that required for this project. Minimum 3-year experience installing similar products.

### 1.06 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.
- C. Remove packaging materials from site and dispose of at appropriate recycling facilities.

### 1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

### 1.09 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

### 1.10 COORDINATION

- A. Coordinate the work of this section and directly related sections with finish flooring work.

### 1.11 WARRANTY

- A. Fully executed, issued in Owner's name, and registered with Manufacturer's including:
  - 1. Manufacturer's Ten (10) year warranty, from date of substantial completion, against moisture damage to finished floor covering.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. GCP Applied Technologies Inc., 62 Whittemore Ave., Cambridge, MA 02140, Phone: (617) 876-1400. (Basis of Specification)
  - 2. TRAXX Corporation, 1201 East Lexington Avenue, Pomona, CA 91766, Phone: 888-872-9926.
  - 3. Architect Approved Equivalent.

## 2.02 MOISTURE SUPPRESSION SYSTEM FOR FLOORING PRODUCTS

- A. Product: KOVARA™ MBX (formerly Versa Shield) Flooring Underlayment as manufactured by GCP Applied Technologies Inc., 62 Whittemore Ave., Cambridge, MA 02140, Phone: (617) 876-1400.
  - 1. Material: Free-standing, dimensionally stable, 4-ply composite product, engineered as a moisture suppression membrane to be used on concrete floors where high moisture exists.
  - 2. Dimensions: Manufacturer's standard roll.
  - 3. Mold, Mildew and Fungal Resistance, ASTM G21: Passed.
  - 4. Moisture Vapor Transmission rate, ASTM E96: Less than 0.01 g/hr/sq m.
  - 5. Flame Spread: Exceed Class 1, per ASTM E648.
  - 6. Smoke Developed: 450 or less, meeting ASTM E662
- B. Accessories:
  - 1. KOVARA™ Tape as manufactured by GCP Applied Technologies Inc.
    - a. Membrane manufacturer's MBX double sided tape and seam tape.
    - b. Properties: Moisture suppression and adhesion per manufacturer's specifications.
    - c. Double sided size: 4 inches.
    - d. Seam Tape: 2 ½" one sided pressure sensitive tape.
  - 2. Primer: As recommended by manufacturer.
  - 3. Patching and leveling compound: Warranted by manufacturer for high moisture applications and approved by membrane manufacturer.
  - 4. Crack Mending Compound: Approved by membrane manufacture as compatible.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Concrete Subfloor:
  - 1. Verify internal RH of the concrete according to ASTM F-2170.
  - 2. Record readings and submit with manufacturer's warranty registration.

## 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Concrete Sub Floor:
  - 1. Prepare floor according to manufacturer's instructions including removal of existing materials on concrete surface, grinding protrusions flat, and filling low spots with water-resistant (moisture resistant, or exterior grade) cementitious patching or leveling compound.
  - 2. Patch cracks greater than 1/8 inch width using manufacturer's approved crack mending compound.
  - 3. Remove debris and excessive dust from the surface.

### 3.03 UNDERLAYMENT INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Where plank type tile or LVT is to be installed, membrane shall be installed perpendicular to the tile/LVT layout.
- C. Install KOVARA™ MBX Double Sided Tape in a 5' x 5' box grid pattern and at both sides of all doorways where membrane runs thru doorway or partition opening. If the particular piece of membrane is less than 16' in length, switch to a 2.5' x 2.5' box grid pattern for the double-sided tape.
- D. Install moisture suppression membrane with smooth film side facing concrete slab.
- E. Do not overlap seams.
- F. If any jobsite condition interferes with compliance with manufacturer's instructions, contact manufacturer and obtain written job-specific procedures. Notify Architect or Owner's representative describing the interfering jobsite condition and manufacturer's job-specific instructions.
- G. Install finish material upon moisture suppression membrane immediately after placement. Minimize all foot traffic and/or rolling loads directly on surface of membrane prior to installation of finish materials.

### 3.04 FLOORING INSTALLATION

- A. Adhesives: Spray adhesives, latex, acrylics, urethanes, poly-urethanes, epoxies, modified mortar, and other non-solvent based adhesives to be applied at "finish flooring" manufacturer's recommended "non-porous spread rates".
- B. Protection: Protect moisture suppression membrane from damage during flooring installation. Do not tear, rip, puncture, or delaminate membrane when applying trowel-on adhesive. Repair damaged areas according to membrane manufacturer's instructions before flooring installation. Provide continuous, intact moisture suppression membrane under entire designated flooring area.
- C. Ceramic and Porcelain Tile: Adhere directly to moisture suppression membrane per tile manufacturer's recommendations.
- D. Vinyl Tile: Adhere directly to moisture suppression membrane using tile manufacturer's recommended adhesive.
- E. Recycled Rubber Flooring: Installation requires review by KOVARA™ Technical Services prior to installation.

### 3.05 INITIAL MAINTENANCE

- A. Upon completion of the finished flooring installation, KOVARA™ MBX requires a minimum of 120 hours (5 days) before conducting initial "wet" cleaning or maintenance. Failure to follow this requirement may result in improper adhesive curing and/or failure of the adhesive bond. Always clean and maintain flooring with neutral PH cleaning products.

### 3.06 PROTECTION

- A. Protect installed products until completion of project.

- B. Touch-up, repair or replace damaged membrane products before installing permanent floor covering.

**END OF SECTION 090561.13**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
  - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
  - 3. Adjustable Aluminum Mullion/Partition Closures.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For firestop tracks, from ICC-ES.

## PART 2 - PRODUCTS

## 2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

## 2.02 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
  - 2. See "Corrosion Protection of Steel Framing" Article in the Evaluations for a discussion of corrosion-resistant coatings on components.
  - 3. Protective Coating: ASTM A653/A653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- C. Studs and Runners: ASTM C645. Use either steel studs and runners or dimpled steel studs and runners.
  - 1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: 20 gauge (0.033 inch).
    - b. Depth: 4 inches, 3-5/8 inches, 2-1/2 inches, 1-5/8 inches as indicated on the drawings.
  - 2. Dimpled Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: 22 gauge (0.027 inch) 0.025 inch.

- D. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      - 2) Steel Network Inc. (The); VertiTrack VTD Series.
- E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: As indicated on Drawings or a minimum of 0.033 inch.
- G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
1. Depth: 1-1/2 inches.
  2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Minimum Base-Metal Thickness: 20 gauge (0.033 inch) 0.033 inch.
  2. Depth: 7/8 inch, 1-1/2 inches as indicated on the drawings.
- I. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
- J. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch and 1 1/4 inch, minimum uncoated-metal thickness of 16 gauge (0.057 inch) gauge, and depth required to fit insulation thickness indicated.
- K. Column Flange Grip Clips: Pre-manufactured Column/Beam connectors for rapid installation of board type materials to Steel Column and Beam Flanges. ASTM A1003/A1003M Structural Grade 33 (230) Type H, ST33H (ST230H): 33ksi (230MPa) minimum yield strength, 45ksi (310MPa) minimum tensile strength, 27mil minimum thickness (22 gauge, 0.0283" design thickness) with ASTM A653/A653M G60 (Z180) hot dipped galvanized coating. Manufacturer: The steel Network, Inc. Unit connection box measures 1 inch deep, 2 inches wide and 2 1/2 inches long with a spring clip depth of 2.375 inches and a curved clip spring clearance of .2 inches.
1. Install as indicated on the drawings. Maximum spacing 24" on center.

### 2.03 SUSPENSION SYSTEMS

- A. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- B. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch wide flanges.
1. Depth: As indicated on Drawings.
- D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 16 gauge (0.057 inch) uncoated-steel thickness, with minimum 1/2-inch wide flanges, 3/4 inch deep.
2. Dimpled Steel Studs and Runners: ASTM C645.
  - a. Minimum Base-Metal Thickness: As indicated on Drawings or 20 gauge (0.033 inch).
  - b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

#### 2.04 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  1. Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
  1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), non-perforated.
  2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
- C. Adjustable Aluminum Mullion/Partition Closures: MULLION MATE – SERIES 40 PLUS extruded aluminum partition closure shall be manufactured by Gordon Interior Specialties Division, Gordon, Inc., 5023 Hazel Jones Road, Bossier City, LA 71111, (800) 747-8954, Fax (800) 877-8746, sales@gordoninteriors.com or approved equal.
  1. Aluminum extrusions: 6063-T5 temper, tensile strength 31 KSI, ASTM B221.
    - a. Size(s): Mullion Mate 3: 2 7/8 inch through 3 15/16 inch, Mullion Mate 4: 4 inch through 4 15/16 inch, Mullion Mate 5: 5 inch through 6 15/16 inch, Mullion Mate 7: 7 inch through 9 3/4 inch, and Mullion Mate 9: 9 inch through 13 3/4 inch or as required by the field conditions.
    - b. Length: 10 foot or as required by field conditions.
    - c. Finish: Acrylic-Polyester hybrid powder-coat paint finish in color as selected by the Architect from the manufacturer's full color offering.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
  1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### 3.03 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
  1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment, services, heavy trim, grab bars, toilet accessories, and furnishings or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.04 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
  2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
  3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
  1. Screw to wood framing where applicable.
  2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.



## F. Z-Furring Members:

1. Erect insulation, specified in Section 072100 - THERMAL INSULATION, vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

## G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

## 3.05 INSTALLING SUSPENSION SYSTEMS

## A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types as indicated.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

## B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

## C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
  - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
  - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

## D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

## E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**END OF SECTION 092216**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Fire resistive Type X Gypsum Board.
  - 3. Moisture and Mold-Resistant gypsum board.
  - 4. Glass-Mat Interior Liner Panels.
  - 5. Cementitious Tile Backer Board.
  - 6. Trim and Accessories.
  - 7. Joint treatment, tapes, compounds and finishing.
  - 8. Miscellaneous metal framing, furring, and fasteners.
  - 9. Sound attenuation insulation and acoustical sealants.
  - 10. All related items necessary to complete the work of this section.

## 1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Submit manufacturers' product information, specifications, and installation instructions for the specified products including joint compounds, fasteners, trim, control joints, joint reinforcing, metal furring members, metal studs, tracks, runners, resilient clips, steel grounds, and all related accessories.
  - 1. Trim Accessories: Full-size Sample in 12-inch (300-mm-) long length for each trim accessory indicated.

## 1.04 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

## 1.05 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

## PART 2 - PRODUCTS

## 2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

## 2.02 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.03 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. National Gypsum Company.
  - 2. USG Corporation.
  - 3. Or approved equal.
- B. Gypsum Wallboard: ASTM C1396/C1396M.
  - 1. Thickness: 5/8 inch (15.9 mm) and 1/2 inch (12.7 mm).
  - 2. Long Edges: Tapered and featured (rounded or beveled) for Pre-filling.
- C. Gypsum Board, Type X: ASTM C1396/C1396M.
  - 1. Thickness: 5/8 inch (15.9 mm) and 1 inch (25.4 mm).
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Core: 5/8 inch (15.9 mm), regular type; 5/8 inch Type X.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.

## 2.04 SPECIALTY GYPSUM BOARD

- A. Glass-Mat Interior Liner Panel: ASTM C 1658/C 1658M with fiberglass mat laminated to both sides. Specifically designed for interior use.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
    - b. Approved equal
  - 2. Core: 1 inch, Type X; Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
    - a. USG Corporation; Glass-Mat Liner Panels Mold Tough.

## 2.05 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. USG Corporation; DUROCK Cement Board.
  - b. Or approved equal.
2. Thickness: 5/8 inch
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
4. Tape: 2 inch wide, coated glass fiber tape for joints and corners;

## 2.06 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
  1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  2. Shapes:
    - a. Cornerbead.
    - b. L-Bead: L-shaped; exposed long flange receives joint compound.
    - c. Expansion (control) joint.
- B. PVC Rip Bead L-Trim (VLZL) with tear-away strip to be removed after drywall finishing and painting to form a crisp, clean edge. 0.028 PVC material with 5/8 inch Tear away flange, 10 foot lengths with perforated flanges. Manufacturer: ClarkDietrich or approved equal.
- C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Fry Reglet Corp.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
  2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified or finish as specified on the drawings..

## 2.07 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
  1. Interior Gypsum Board: Paper.
  2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Pre-filling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  4. Finish Coat: For third coat, use setting-type, sandable topping compound.

## 2.08 MATERIALS

- A. Metal Framing: Protective coating of framing shall conform to ASTM A653/A653M - G40 minimum, or shall be a protective coating with equal or better corrosion resistance.

1. Runners: In compliance with ASTM C645, provide 1-1/2" galvanized steel runners to match applicable assembly specified, to match wall framing members, unless indicated otherwise.
  2. Furring members: In compliance with ASTM C645, provide galvanized cold rolled steel, 0.0296" minimum thickness of base metal or 20 gage min., screw type hat shaped channels; 7/8" depth, width approx. 2 3/4", hemmed edges. Where furring channels are used in conjunction with resilient clips, width of channel shall be coordinated with clip configuration to ensure proper fit.
  3. Vertical Supports: 1" x 1/8" steel flat bars installed a maximum 4'-0" on center, slotted for 3/8" diameter bolts at each end. 3" x 3" x 3/16" steel angle, slotted to receive 3/8" diameter bolt and faster to truss above with a safe working load of 300 pounds minimum.
  4. Fasteners for Metal Framing: Provide fasteners of type, size, style, grade, holding power, class, and other properties required for secure installation of framing and furring. Galvanize all fasteners and accessories. All devices, other than bolts, used to interconnect ceiling members are required to be certified and listed by an Approved Agency.
- B. Fasteners: Fasteners for securing board to metal furring or wood shall be Phillips Head, black oxidized screws made for fastening gypsum wall board, size and length as recommended by the drywall manufacturer for the applications shown.
- C. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.09 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
    - b. Grabber Construction Products; Acoustical Sealant GSC.
    - c. Pecora Corporation; AC-20 FTR AIS-919.
    - d. USG Corporation; SHEETROCK Acoustical Sealant.
    - e. Approved Equal.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 1/2-inch (6.4 to 12.7-mm) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: As indicated on Drawings.
  - 2. Type X: As indicated on Drawings.
  - 3. Ceiling Type: As indicated on Drawings.

4. Moisture- and Mold-Resistant Type: As indicated on Drawings.
  5. Glass-Mat Interior Liner Panel Type: As indicated on Drawings.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
  2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

### 3.04 CONSTRUCTION TOLERANCES

- A. Do not exceed 1/8" in 8'-0" variation from plumb or level in any exposed line or surface, except at joints between units do not exceed 1/16" variation between planes of abutting edges or ends. Shim as required to comply with specified tolerances. Variations shall not be visible in finished surfaces.
- B. For soffits and ceilings verify that direct suspension system has been installed properly, that main runners are spaced evenly and have been leveled to a tolerance of 1/8" in 12 feet measured both lengthwise on each runner and transversely between parallel runners so that furring member installation may proceed accurately.
- C. Cementitious Backer Units: ANSI A108.11, at showers and locations indicated to receive tile.
- D. Water-Resistant Backing Board: Install where indicated with 1/4 inch (6.4 mm) gap where panels abut other construction or penetrations.

### 3.05 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:



1. Exposed Edges: Where an exposed edge of gypsum drywall abuts dissimilar materials use Gold Bond #C250 casing bead or equal. Casing beads to be finished with joint compound. Same casing bead and joint treatment is to be used on exposed wallboard edges.
- D. Trim: 1/16 inch thick extruded aluminum 6063-T5 mill finish manufactured by Gorden Inc. or approved equal:
  1. J-Trim: Model JD-58
  2. Control Joint: Model RD-5810
  3. Corner Joint: Model FD-5810
  4. 'F' Reveal: Model 412-5/8
  5. Reveal Trim: Series 900, Model 904 RT-12
  6. Trim Reveal: Series 300, Model 312-5/8.
- E. Neatly cut all openings so that they may be covered by plates and escutcheons.
- F. Place control joints consistent with lines of building spaces as directed.
  1. Gypsum Panel surfaces should be isolated with control joints or other means where:
    - a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling;
    - b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration; construction changes or ceiling;
    - c. Construction changes within the plane of the partition or ceiling;
    - d. Partition or furring run exceeds 30 feet;
    - e. Ceiling dimensions exceed 50 feet in either direction;
    - f. The area within separate ceiling sections exceeds 2,500 sq. ft.;
    - g. Wings of "L", "U", and "T" shaped ceiling areas are joined;
  2. Penetrations of the gypsum panel diaphragm, such as door frames, borrowed-light openings, vents, grilles, access panels and light troffers, require additional reinforcement at the corners to distribute concentrated stresses if a control joint is not used.
  3. Place edge trim where gypsum board abuts dissimilar materials. Use longest practical length.
  4. Provide additional framing and blocking as required to support gypsum board at openings and cutouts, and to support built-in anchorage and attachment devices for other work.
  5. Coordinate installation of joint sealers specified in Section 079200 at penetrations and where abutting different materials.
  6. Cornerbead: Use at outside corners unless otherwise indicated.
  7. LC-Bead: Use where indicated.
  8. L-Bead: Use where indicated.

### 3.06 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Pre-fill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Prepared surface shall be coated with a drywall primer/sealer prior to the application of finish paint.
  - a. Primer and its application to surfaces are specified in Section 099100 - Painting.
3. Level 5: Where indicated on Drawings.
  - a. Primer and its application to surfaces are specified in Section 099100 - Painting.

### 3.07 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 092900**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Porcelain floor tile and base.
  - 2. Ceramic wall tile.
  - 3. Stone thresholds.
  - 4. Waterproof membrane.
  - 5. Metal edge strips.

## 1.03 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

## 1.04 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction (DCOF AcuTest): For tile installed on walkway surfaces, provide products with the following values as determined by testing in accordance with ANSI A137.1, Section 9.6:
  - 1. Level Surfaces: Minimum 0.42.
  - 2. Step Treads: Minimum 0.42.
  - 3. Ramp Surfaces: 0.42.

## 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

## 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.

## 1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

## 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

## 2.01 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

- F. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- G. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

## 2.02 TILE PRODUCTS

- A. Glazed Wall Tile (PHASE 1):
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. American Olean - glazed wall tile, base and trim.Color Story™ Wall Neutral
    - b. Or approved equal.
  - 2. Module Size: Size: 3" x 6" x 5/16" dust pressed body, cushion edged with contact spacer lugs.or as indicated on the drawings.
  - 3. Thickness: 1/4 inch (8 mm).
  - 4. Finish: Polished, clear glaze.
  - 5. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
  - 6. Grout Color: As selected by Architect from manufacturer's full range.
  - 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes.
- B. Porcelain Paver Tile (PHASE 2):
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Daltile; Division of Dal-Tile International Inc: Astronomy
    - b. Or approved equal.
  - 2. Module Size: 12 inch by 24 inch (305 by 1330 mm) or as indicated on the drawings.
  - 3. Thickness: 3/8 inch (10 mm).
  - 4. Face: Tru-Edge (square)
  - 5. Finish: Textured
  - 6. Tile Color and Pattern: As selected by the Architect from the manufacturer's full color offering.
  - 7. Moisture Absorption: less than 0.5%
  - 8. Grout Color: As selected by Architect from manufacturer's full range.
  - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes.
    - a. Sanitary Cove Base: P-36C9TB (6" x 12")
- C. Glazed Ceramic Wall Tile (PHASE 2):
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Daltile; Division of Dal-Tile International Inc: Linear Color Wheel Collection
    - b. Or approved equal.
  - 2. Module Size: 6 x 18, 4" x 12" and 2" x 8", or as indicated on the drawings.
  - 3. Thickness: 1/4 inch (8 mm).
  - 4. Face: Bevel edges.
  - 5. Finish: Polished, clear glaze.
  - 6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
  - 7. Moisture Absorption: less than 20% (wall)

8. Scratch Hardness (MOHS): 4.0 - 6.0
9. Grout Color: As selected by Architect from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes.
  - a. Flat Top Cove Base: A3601 6" x 6"
11. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

### 2.03 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Granite Thresholds: ASTM C615/C615M, with honed finish.
  1. Description: Uniform, medium-grained, gray stone without veining.

### 2.04 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.
  1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Noble Company (The); Nobleseal TS.
    - b. Or approved equal.

### 2.05 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
  1. Cleavage Membrane: Asphalt felt, ASTM D226/D226M, Type I (No. 15); or polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.
  2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57-mm) diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
  3. Latex Additive: Manufacturer's standard acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Laticrete International, Inc.
    - b. MAPEI Corporation
    - c. TEC; a subsidiary of H. B. Fuller Company.

2. Provide prepackaged, dry-mortar mix containing dry, redispersable, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

## 2.06 GROUT MATERIALS

- A. Polymer-Modified Tile Grout: ANSI A118.7.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Laticrete International, Inc.
    - b. MAPEI Corporation
    - c. TEC; a subsidiary of H. B. Fuller Company.
  2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersable form, prepackaged with other dry ingredients.
  3. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D. Use in Toilet Room Floor installations.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Laticrete International, Inc.
    - b. MAPEI Corporation
    - c. TEC; a subsidiary of H. B. Fuller Company
  2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.
- C. Grout for Pregrouted Tile Sheets: Same product used in factory to pregrout tile sheets.

## 2.07 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 - JOINT SEALANTS.
  1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. Multipart, Pourable Urethane Sealant for Use T: ASTM C920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Degussa Building Systems; Sonneborn Sonolastic SL 2
    - b. Pecora Corporation; Dynatrol II-SG.
    - c. Sika Corporation; Sikaflex-2c SL.
    - d. Tremco Incorporated; Vulkem 245.

## 2.08 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A666, 300 Series exposed-edge material.
- C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
  - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
  - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Bonsal American; an Oldcastle company; Grout Sealer.
    - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer .
    - c. C-Cure; Penetrating Sealer 978.
    - d. Custom Building Products; Grout and Tile Sealer.
    - e. Jamo Inc.; Penetrating Sealer.
    - f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
    - g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
    - h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
    - i. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

## 2.09 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.



1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
  - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
  - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

### 3.03 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
    - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
    - c. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Paver Tile: 1/8 inch.
  - 2. Glazed Porcelain Wall Tile: 1/8 inch (4.8 mm).
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
  - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
  - 2. Do not extend waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

### 3.04 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

### 3.05 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. For epoxy grout installations utilize recommended grout haze cleaner as recommended by the tile manufacturer. Use

- only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
  - C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
  - D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

### 3.06 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
  1. Tile Installation F114: Cement mortar bed (thickset) with cleavage membrane; epoxy grout; TCNA F114 and ANSI A108.1B.
    - a. Tile Type: Porcelain ceramic tile in Lobby, Kitchen and Toilet areas.
    - b. Thin-Set Mortar for Cured-Bed Method: Medium-bed, latex- portland cement mortar.
    - c. Grout: Water-cleanable epoxy grout.
  2. Tile Installation F121: Cement mortar bed (thickset) on waterproof membrane; TCNA F121 and ANSI A108.1C.
    - a. Tile Type: Porcelain ceramic tile.
    - b. Thin-Set Mortar for Cured-Bed Method: Medium-bed, latex- portland cement mortar.
    - c. Grout: Polymer-modified sanded grout.

**END OF SECTION 093000**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Suspended acoustical ceilings including the following:
  - 1. Acoustical panels (suspended).
  - 2. Stone wool open plenum ceiling systems.
  - 3. Exposed tee metal grid ceiling system and perimeter trim.

## 1.02 RELATED SECTIONS

- A. Section 072100 - THERMAL INSULATION
- B. Section 079200 - JOINT SEALANTS.
- C. Section 083113 - ACCESS DOORS AND FRAMES.
- D. Section 092116 - GYPSUM BOARD SHAFT WALL ASSEMBLIES
- E. Section 265000 - LIGHTING

## 1.03 REFERENCES

- A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- B. ASTM International (ASTM):
  - 1. ASTM A635 - Standard Specification for Steel.
  - 2. ASTM C367 - Standard Test Methods for Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-in Ceiling Panels.
  - 3. ASTM C365/C365M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
  - 4. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
  - 5. ASTM E84 - Surface Burning Characteristics.
  - 6. ASTM E119 - Fire Tests of Building Construction and Material.
  - 7. ASTM E580/E580M - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
  - 8. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- C. American Society of Civil Engineers (ASCE):
  - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- D. Ceiling and Interior Systems Construction Association (CISCA):
  - 1. CISCA Handbook - Acoustical Ceilings: Use and Practice.
  - 2. ASCE 7 and CISCA (AC) - Recommendations for Direct Hung Acoustical Tile and Lay-In Panel Ceilings - Seismic Zones 0-2.
  - 3. ASCE 7 and CISCA (AC) - Recommendations for Direct Hung Acoustical Suspension Ceiling Assemblies - Seismic Zones 3-4.
- E. US Green Building Council (USGBC):
  - 1. Leadership in Energy and Environmental Design (LEED) green building rating system.
- F. Underwriters Laboratory (UL):
  - 1. UL - Fire Resistance Directory.
  - 2. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

- G. Warnock Hersey (WH):
  - 1. WH - Certification Listings.

#### 1.04 DESIGN / PERFORMANCE REQUIREMENTS

- A. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.
- B. Fire-Test-Response Characteristics:
  - 1. Fire-Resistance Characteristics: Where indicated on the Drawings, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
    - a. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E1264 for Class A, B, or C products specified, when tested per ASTM E84.
- C. Seismic Standard: Verify requirements of authorities having jurisdiction as to which subparagraphs below to reference if any.
  - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
  - 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
  - 3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 and 4."
  - 4. IBC Section 1613, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
  - 5. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

#### 1.05 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Dimensions, load carrying capacity, and performance standards compliance.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation and maintenance instructions.
- C. Shop Drawings: Reflected ceiling plan indicating ceiling layouts, dimensions and perimeter conditions, and ceiling schedule including panel and grid types to match codes used on the Drawings. Indicate grid layouts and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system. Indicate method of suspension where interference exists.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, actual size of acoustical units, and two samples minimum size 12 inches (300 mm) long of main tees and cross tees square, representing actual product, color, finish and patterns.

- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of all components.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Manufacturer member in good standing of CISCA (Ceiling and Interior Systems Construction Association)
- C. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience.
- D. Provide seismic design of suspended ceiling under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.
- E. Pre-installation Conference: Conduct conference at Project site minimum one week before installation. Agenda shall include project conditions, coordination with work of other trades, and layout of items which penetrate ceilings.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet conditions such as concrete, plaster, paint, and adhesives have been completed and cured.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Protect system components from excessive moisture in shipment, storage, and handling.

#### 1.08 SEQUENCING

- A. Sequence Work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities and wet work have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustic units after interior wet work is dry.
- C. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

#### 1.09 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

#### 1.10 WARRANTY

- A. Warranty: Provide manufacturer's standard warranty against manufacturing defects in material or workmanship when installed in accordance with the current CISCA Handbook and ASTM C367.
  - 1. Warranty Period: 30 years.

## 1.11 EXTRA MATERIALS

- A. See Section 016100 - BASIC PRODUCT REQUIREMENTS.
- B. Deliver extra acoustical units for Owner's use in maintenance. Label and store where directed by the Owner including codes used on the Drawings. Do not deliver to the Project site until the Owner is prepared to receive and store maintenance materials.
  - 1. Tile: Furnish 5 percent of total acoustic unit area of extra tile to Owner.
  - 2. Panels: Furnish 5 percent of total acoustic unit area of extra panels to Owner.
  - 3. Suspension System Components: Furnish 5 percent of each exposed component of the quantity installed.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable Manufacturer: ROCKFON, which is located at: 4849 S. Austin Ave.; Chicago, IL 60638; Toll Free Tel: 800-323-7164; Tel: 708-563-4600; Fax: 800-222-3744; Email: request info (cs@rockfon.com)
- B. Requests for substitutions will be considered in accordance with provisions of Section 012500 - PRODUCT SUBSTITUTION PROCEDURES.

## 2.02 ACOUSTICAL TILES AND PANELS

- A. ACP-1: Design White Acoustic Ceilings: Provide ROCKFON Sonar, stone wool (mineral wool) factory painted glass scrim ceilings conforming to the following:
  - 1. ASTM E1264ASTM E1264 Classification: Type ACP 1.
  - 2. Color: White.
  - 3. Texture: Lightly textured.
  - 4. Edges: Square Tegular Narrow (SLN).
  - 5. Size: 24 by 24 inch (609 by 609 mm).
  - 6. Thickness: 1 inch (25 mm).
  - 7. Lbs/Sq.ft: 0.69-0.84
  - 8. Noise Reduction Coefficient (NRC): 0.90 to 0.95.
  - 9. Ceiling Attenuation Class (CAC): 22-25.
  - 10. Articulation Class (AC): 190.
  - 11. Fire Class: Class A.
  - 12. Fire Performance UL 723 (ASTM E84) Flame Spread / Smoke Developed: 0/0.
  - 13. Light Reflectance (LR): 0.85.
  - 14. Sag Resistance: Dimensionally stable up to 100% relative humidity/32 degrees F to 104 degrees F.
  - 15. Recycled Content: Up to 38 percent.
  - 16. R Value (BTU Units): 2.6 to 3.5.
  - 17. RSI Value (Watts Units): 0.46 to 0.62.
  - 18. VOC: GreenGuard Gold
- B. ACP-2: Commercial Acoustic Ceilings: Provide ROCKFON Cinema Black, stone wool (mineral wool) factory painted glass scrim ceilings conforming to the following:
  - 1. ASTM E1264 Classification: Type XX, Pattern G.
  - 2. Color: Matte black.
  - 3. Texture: Lightly textured.
  - 4. Edges: Square Lay In (SQ).
  - 5. Size: 24 by 24 inch (609 by 609 mm).

6. Size: 24 by 48 inch (609 by 1219 mm).
  7. Thickness: 5/8 inch (16 mm). Thickness: 1 inch (25 mm).
  8. Lbs./Sq. ft.: 0.38-0.45
  9. Noise Reduction Coefficient (NRC): 0.85.
  10. Fire Class: Class A.
  11. Fire Performance UL 723 (ASTM E84) Flame Spread / Smoke Developed: 5/0.
  12. Light Reflectance (LR): 0.04.
  13. Sag Resistance: Dimensionally stable up to 100% relative humidity/32 degrees F to 104 degrees F.
  14. Recycled Content: Up to 43 percent.
  15. R Value (BTU Units): 2.2.
  16. R Value (BTU Units): 3.5.
  17. RSI Value (Watts Units): 0.39.
  18. RSI Value (Watts Units): 0.62.
  19. VOC: GreenGuard Gold.
- C. ACP-3: Special Hygiene Area Acoustic Ceilings: Provide ROCKFON Hygienic Plus stone wool (mineral wool) factory painted glass scrim ceilings, rear side covered with black fleece, with sealed edges conforming to the following:
1. ASTM E1264 Classification: Type ACP-3.
  2. Clean Room Classification: ISO14644, Class 5, low particle emission.
  3. Bacteriological Class: B1 (NF S 90-351, best class). Does not contribute to the growth of Methicillin Resistant Staphylococcus Aureus (MRSA), bacteria resistant against antibiotics, candida albicans, and aspergillus niger mold responsible for pneumonias.
  4. Enhanced, highly water repellant surface can be disinfected by steam cleaning, vacuum cleaned and resists diluted solution of ammonia, chlorine, quaternary ammonium and hydrogen peroxide.
  5. Color: White.
  6. Texture: Smooth.
  7. Edges: Square Lay In (SQ).
  8. Size: 24 by 24 inch (609 by 609 mm).
  9. Thickness: 3/4 inch (19 mm).
  10. Lbs./Sq. ft.: 0.45
  11. Noise Reduction Coefficient (NRC): 0.90.
  12. Ceiling Attenuation Class (CAC): 22.
  13. Fire Class: Class A.
  14. Fire Performance UL 723 (ASTM E84) Flame Spread / Smoke Developed: 0/5.
  15. Light Reflectance (LR): 0.83.
  16. Sag Resistance: Dimensionally stable up to 100% relative humidity/32 degrees F to 104 degrees F.
  17. Recycled Content: Up to 38 percent.
  18. R Value (BTU Units): 2.6.
  19. RSI Value (Watts Units): 0.46.
  20. VOC: GreenGuard Gold

### 2.03 SUSPENSION SYSTEM COMPONENTS - TYPICAL

- A. Provide suspension system components from the same manufacturer as the acoustical ceiling components unless approved by the ceiling manufacturer in writing to comply with manufacturer's installation and warranty requirements.
- B. Performance Standards: Suspension system manufacturer's standard direct-hung metal suspension system and attachment devices complying with project requirements and applicable building codes and regulations applicable at the location of the project.
  1. Suspension components shall comply with ASTM C635.



## 2.04 SUSPENSION SYSTEM COMPONENTS - GENERAL APPLICATIONS

- A. Tempura 9/16 inch (14.2 mm) Exposed Grid: ACP 1
  - 1. Non-fire Rated Grid: Chicago Metallic, Tempura 4000.
  - 2. Fire Rated Grid: Chicago Metallic, Tempura 4050.
  - 3. Intermediate duty.
  - 4. Heavy duty.
  - 5. Main Tees:
    - a. Materials: Commercial quality galvanized steel 9/16 inch (14.2 mm) wide I by 1-1/2 or 1-5/8 inch (38 or 41.2 mm) high as recommended by the manufacturer based on application, by longest practical length with factory punched cross tee slots, hanger holes, miters, and integral couplings.
    - b. Capping: Steel with standard factory applied baked-on enamel paint.
    - c. Capping: Aluminum with standard factory applied baked-on enamel paint.
  - 6. Cross Tees:
    - a. Materials: Commercial quality galvanized steel 9/16 inch (14.2 mm) wide by 1-1/2 inch (38 mm) high by longest practical length, factory punched cross tee slots, hanger holes, and either snap-in or stab-in end tabs.
    - b. Finish and Reveal: Identical to main tees.
- B. 15/16 inch (23.8 mm) Exposed Seismic-Grid: ACP-2, ACP-3
  - 1. Intermediate duty.
  - 2. Heavy duty.
  - 3. Main Tees:
    - a. Materials: Commercial quality galvanized steel in thickness recommended by the manufacturer based on application, 15/16 inch (23.8 mm) wide by 1-1/2 inch (38 mm) high by longest practical length with factory punched cross tee slots, hanger holes, and integral bayonet-style end couplings.
    - b. Capping: Steel affixed to 15/16 inch (23.8 mm) wide flange.
  - 4. Cross Tees:
    - a. Materials: Commercial quality galvanized steel in thickness recommended by the manufacturer based on application, 15/16 inch (23.8 mm) wide by 1-1/2 or 1-5/16 inch (33 or 38 mm) high as recommended by the manufacturer based on application, by longest practical length factory punched cross tee slots and hanger holes.
    - b. Cap and Finish: Identical to main tees.

## 2.05 METAL EDGE MOLDING AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim:
  - 1. Profile: Rockfon Infinity profile perimeter trim for T-bar type grid acoustical ceilings.
    - a. Size: 2 inch (50 mm) high with horizontal face.
    - b. Size: 4 inch (100 mm) high with horizontal face.
    - c. Panels to be straight as indicated on approved drawings.
    - d. Corners to be factory mitered.
    - e. 90 degree corner kits are allowed in place of mitered corners on straight sections.
- B. Splice Plate: Manufactured from galvanized steel with set screw for splicing sections of perimeter trim.
- C. Grid Clips: Manufactured from galvanized steel with set screw for attaching perimeter trim to suspension system members.
- D. Paired Bracket: Manufactured from electro-galvanized steel and used for back-to-back Infinity installations. Size bracket to maintain panel vertical surfaces as follows:

1. 2-1/4 inch (57 mm) apart with 3/4 inch (19 mm) opening at bottom.
2. 2-7/8 inches (73 mm) apart with 1-3/8 inch (35 mm) opening at bottom.
3. As shown on the Drawings.

## 2.06 ACCESSORIES

- A. Chicago Metallic 1494 Seismic Separation Joint Clips:
  1. Used in IBC category D, E, and F seismic zones as an alternate method of creating a traditional separation joint.
  2. The 1494 clip can be used to create a ceiling joint across a main runner or cross tee and can be used to create a 2 directional movement in a ceiling.
  3. Carrying only one clip reduces inventory and installation mistakes are reduced with our locator notches and locator tab.
- B. Chicago Metallic 1496 Seismic Perimeter Clips:
  1. Used in IBC category C, D, E, and F seismic zones as an alternate method of stabilizing the perimeters of suspended ceiling components.
  2. Allows tees to move into or away from the wall angle and has been tested and recognized as an alternate method of stabilizing tees at the perimeter.
  3. Refer to ICCES ESR #2631 for more information.
  4. Bright gold color makes clips easily identifiable on the job site.
- C. Acoustic Sealant for Perimeter Moldings: Specified in Section 079200 - JOINT SEALANTS.
- D. Gasket for Perimeter Moldings: Where gasket is not factory installed but required for particular applications, provide closed cell rubber sponge tape.

## 2.07 FINISHES

- A. Provide the following factory finish:
  1. White (ACP-1 & ACP-3)
  2. Black (ACP-2)

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify layout of hangers will not interfere with other work.
- C. Verify acoustical unit layout conditions, which will adversely affect installation.
- D. If layout or substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Verify wet work such as plastering and concrete is complete and dry. Verify building is enclosed and under standard occupancy conditions prior to start of installation.
- F. Commencement of installation constitutes Installer's acceptance of substrate conditions.

## 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction, including the following:
  - 1. Comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook".
  - 2. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 3. Additional Hanger Wires: Wrapped tightly 3 full turns to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span or tolerances specified below.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
- D. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
- E. Do not attach hangers to steel deck tabs.
- F. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
- G. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- H. Install seismic separation tees so they are square and securely interlocked with one another, and in compliance with requirements of authority having jurisdiction.
- I. Angle Moldings: Install on vertical surfaces, intersecting suspension components as recommended by the manufacturer.
- J. Channel Moldings: Install on vertical surfaces, intersecting suspension components as recommended by the manufacturer.
- K. Shadow Line Moldings: Install on vertical surfaces, intersecting suspension components as recommended by the manufacturer.
- L. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) on center and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m).
  - 2. Miter corners accurately and connect securely.
  - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

**3.04 ERECTION TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**3.05 PROTECTION AND CLEANING**

- A. Protect installed products until completion of project.
- B. Clean adjacent surfaces and remove unused materials and debris from site.
- C. Clean exposed surfaces in accordance with manufacturer's written instructions.
- D. Remove and reinstall improperly installed material.
- E. Remove damaged components, replace with undamaged components.
- F. Touch-up, repair or replace damaged units until satisfactory results are obtained.
- G. Clean with non-solvent based non-abrasive commercial cleaning solution.

**END OF SECTION 095113.11**

## PART I GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Rubber Wall Base.
  - 2. Rubber Stair Treads, Risers, and Rubber Landing Surfacing.
  - 3. Edge Strips and Transitions
  - 4. Related Accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 096566 - Recycled Rubber Athletic Flooring
  - 2. Section 096519.23 - Luxury Vinyl Tile

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. RFCI Handbook.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
  - 1. Product Data: Manufacturer's technical data for each type of resilient base, stair tread and accessory.
  - 2. Samples for Initial Selection Purpose: Manufacturer's standard and custom color samples in form of actual sections of rubber base, rubber stair treads, risers, and stair landing surfacing, including accessories, showing full range of colors and patterns available for each type of resilient and rubber flooring or base required. The Architect shall select the colors, patterns, and textures from the manufacturer's complete range of standard and custom colors.
- B. Maintenance Instructions: Submit two (2) Copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.
- C. Pursuant to Section 016000 - Product Requirements

## 1.05 QUALITY ASSURANCE

- A. Experienced workmen familiar with the work and according to manufacturers' recommendations and/or industry standards shall perform all work of this section.
- B. Provide each type of resilient base and accessories as produced by a single manufacturer, including recommended primers, adhesive, sealants, and leveling compounds.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.

- C. Store and install only where space temperatures are within resilient materials manufacturer's specified range. Thereafter, maintain resilient materials manufacturer's specified environmental conditions.

#### 1.07 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65-degrees F (18 deg C) in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient base materials in spaces where they will be installed for at least 48 hours before beginning installation. Maintain minimum temperature of 55 degrees F (13 deg C) in areas where work is completed.
- B. Install resilient base and accessories after other finishing operations, including painting, have been completed.

#### 1.08 EXTRA MATERIALS

- A. Furnish an extra 3% of each base type, shape, size, gloss, and color in clean marked containers for Owner's use.

### PART 2 PRODUCTS

#### 2.01 RESILIENT BASE

- A. Acceptable Manufacturers
  - 1. Armstrong World Industries, Inc.
  - 2. Roppe Corporation, USA
  - 3. Johnsonite.
  - 4. Architect Approved Equivalent
- B. Material: Rubber.
- C. Height: 6 inch
- D. Toe shape: Cove, with toe.
- E. Thickness: 1/8 in.
- F. Color: Selection by Architect from manufacturer's standard array.

#### 2.02 STAIR COVERING MATERIALS:

- A. Stair Treads and Riser: Molded rubber, 1/4-inch-thick at nose tapering to 1/8-inch-thick at back edge and riser; FS RR-T-650, Composition A, Type 2 - Designed; full width and depth of stair tread and riser in one piece; raised pattern design (tread); square nose returning down edge of tread 1-1/2 inches. Provide with self-illuminating abrasive glow strips.
- B. Adhesive: As recommended by the stair covering material manufacturer for the type of substrate indicated.
- C. Void Filler: As recommended by the stair tread manufacturer to fill voids and open spaces at the nosing between the stair tread and stair substrate. Recommended void filler to be used also at junction of riser and tread, as chamfer support for rubber.

### 2.03 STAIR LANDING TILES

- A. 1/8" thick, manufacturer's standard tile size with raised square design to match stair treads

### 2.04 FLOOR TRANSITIONS AND EDGE MOULDINGS

- A. Acceptable Manufacturers
  - 1. Johnsonite.
  - 2. Armstrong World Industries, Inc.
  - 3. Roppe Corporation, USA
  - 4. Architect Approved Equivalent
- B. Material: Rubber.
- C.
- D.

### 2.05 ACCESSORY MATERIALS

- A. Adhesive: Resilient base manufacturers recommended product that meets VOC requirements of the project.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. The Installer shall inspect subfloor & wall surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, and ridges. Coatings preventing adhesive bond, and other defects that impair performance or appearance shall be corrected.
- B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well to ascertain presence of curing compounds. Slab tolerance to be 1/16-inch per 1'-0" max. Coordinate with concrete contractor. (Manufacturer recommendation will supercede this requirement).
- C. Do not allow stair tread flooring work to proceed until subfloor surfaces are satisfactory.
- D. Vacuum surfaces to be covered and inspect floor.

### 3.02 INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners.
  - 1. Cove base shall not be cut on the line of an outside corner.
- B. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
  - 1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Before starting installation, layout base material to provide the minimum number of joints with no strip less than 24 inches in length.

- D. Roll base for complete adhesion.
- E. Rubber Stair Accessories:
  - 1. Provide stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
  - 2. Tightly adhere to substrates throughout length of each piece.
  - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

### 3.03 CLEANING AND PROTECTION

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.
- B. Keep traffic off resilient material for at least 72 hours after installation.
- C. Clean and polish materials in the following order:
  - 1. After two weeks, scrub resilient base, sheet rubber and tread materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
  - 2. Do not polish tread and sheet rubber material.
- D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until Substantial Completion.
- E. When protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

### END OF SECTION 096513



## PART I GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Luxury Solid Vinyl Tile (LVT)
  - 2. Edge Strips.
  - 3. Related Accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 033000 - Cast-In-Place Concrete
  - 2. Section 090561.13 - Moisture Vapor Emission Control
  - 3. Section 096513 - Resilient Base and Accessories

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. RFCI Handbook.
- C. ASTM F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring".

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
  - 1. Product Data: Manufacturer's technical data for each type of resilient flooring and accessory.
  - 2. Samples for Initial Selection Purpose: Manufacturer's standard and custom color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available for each type of resilient and rubber flooring required. The Architect shall select the colors, patterns, and textures from the manufacturer's complete range of standard and custom colors.
- B. Maintenance Instructions: Submit two (2) Copies of manufacturer's recommended maintenance practices for Luxury Vinyl Tile flooring and accessories.
- C. Pursuant to Section 016000 - Product Requirements

## 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturers' recommendations and/or industry standards shall perform all work of this section.
- B. Provide each type of Luxury Vinyl Tile flooring and accessories as produced by a single manufacturer, including recommended primers, adhesive, sealants, and leveling compounds.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.

- B. Protect against moisture exposure and damage.
- C. Store and install only where space temperatures are within resilient materials manufacturer's specified range. Thereafter, maintain resilient materials manufacturer's specified environmental conditions.

#### 1.07 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65-degrees F in spaces to receive luxury vinyl tile for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store luxury vinyl tile flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Maintain minimum temperature of 55 degrees F in areas where work is completed.
- B. Install luxury vinyl tile flooring and accessories after other finishing operations, including painting, have been completed. Do not install luxury vinyl tile flooring over concrete slabs until the installation of the moisture vapor emission control membrane is complete.

#### 1.08 MANDATORY TESTING

- A. Hardened concrete to receive resilient flooring shall be tested using anhydrous calcium chloride test for measurement of vapor emissions.
  - 1. Three (3) tests shall be required for initial 2,000 sq. ft. and one (1) additional test for each 1,000 sq. ft. of floor over 2,000 sq. ft.
  - 2. All tests must be done simultaneously.
  - 3. Resilient flooring shall not be installed unless tests meet or exceed manufacturer's recommendations for their adhesive and flooring.
  - 4. Test must be performed by an independent testing agency.
  - 5. Testing agency shall supply three (3) copies of test results to the Architect.

#### 1.09 EXTRA MATERIALS

- A. Furnish an extra 3% of each tile type, shape, size, gloss, and color in clean marked containers for Owner's use.

### PART 2 PRODUCTS

#### 2.01 LUXURY SOLID VINYL TILE

- A. Manufacturer
  - 1. Armstrong World Industries, Inc., Theorem and Natural Creations with Diamond 10 Technology.
- B. Products.
  - 1. Description: A layered construction consisting of a tough, clear, vinyl wear layer protecting a high-fidelity print layer on a solid vinyl backing. Protected by a UV-cured polyurethane finish, the wear surface is embossed with different textures to enhance each of the printed visuals. Colors are insoluble in water and resistant to cleaning agents and light.
  - 2. Luxury Vinyl Tile shall conform to the requirements of ASTM F 1700, "Standard Specification for Solid Vinyl Tile", Class III, Type B - Embossed Surface.
- C. Color: As selected by the Architect from all available colors in the Natural Creations and Theorem collections. Multiple colors may be used.

- D. Size: 4 inch x 48 inch, 6 inch x 36 inch, and 12 inch x 24 inch as selected by the Architect. Multiple widths/lengths may be used.

## 2.02 VAPOR REDUCTION MEMBRANE

- A. See Specification Section 090561.13.

## 2.03 ACCESSORY MATERIALS

- A. Adhesive: Luxury Vinyl Tile manufacturer's recommendation for each product, substrate, and location; must meet manufacturer's warranty requirements.
- B. Leveling and Underlayment Compound:
  - 1. Where required- verify with architect prior to placement.
  - 2. Latex cementitious type as required by moisture vapor emission control manufacturer. Minimum 28-day compressive strength: 4000-lb./sq. ft.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. The Installer shall inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, and ridges. Coatings preventing adhesive bond, and other defects impair performance or appearance.
- B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well to ascertain presence of curing compounds. Slab tolerance to be 1/16-inch per 1'-0" max. Coordinate with concrete slab contractor. (Manufacturer recommendation will supersede this requirement).
- C. Do not allow luxury vinyl tile flooring work to proceed until subfloor surfaces are satisfactory.

### 3.02 PREPARATION

- A. Test substrate to ensure proper dryness.
- B. Prepare subfloor surfaces as follows:
  - 1. Use leveling, and patching compounds as recommended by moisture vapor emission control manufacturer for filling small cracks, holes, and depressions in subfloors. Maximum surface variation: 1/8-inch in 10-feet in any direction.
  - 2. Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
- C. Vacuum surfaces to be covered and inspect floor.
- D. Apply moisture vapor reduction membrane, prior to application of adhesive. Apply in compliance with manufacturer's directions.

### 3.03 INSTALLATION

- A. Standards: Manufacturer's published instructions.

- B. Lay tile and related materials so that fields or patterns center on areas, so that tile at opposite edges of room are of equal width.
  - 1. Adjust pattern that edge pieces are not less than 1/2 tile size.
  - 2. Lay tile square to room axis, unless otherwise shown.
  - 3. Verify moisture membrane has been laid perpendicular to the luxury vinyl tile direction.
  - 4. Stagger adjacent tiles per manufacturer's recommendation or as directed by the Architect.
- C. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged, if so numbered.
- D. Lay materials true to line, level, and with tight joints. Scribe, cut, and tightly fit materials to and around permanent fixtures, equipment, pipes, and bases. Extend luxury vinyl tile into toe spaces, door reveals, and into closets and similar openings.
  - 1. Lay tile with grain running in same directions.
- E. Tightly cement luxury vinyl tile to subbase (using full spread of adhesive applied in compliance with flooring manufacturer's directions) without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll luxury vinyl tile flooring at perimeter of each covered area to assure adhesion.
- F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- G. After installation, remove excessive adhesive pursuant to luxury vinyl tile manufacturer's published instructions.

### 3.04 INSTALLATION OF ACCESSORIES

- A. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed and extends beyond.
- B. Do not install LVT after wall tile installation.
- C. Rubber Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

### 3.05 CLEANING AND PROTECTION

- A. Sweep and vacuum tile surfaces thoroughly.
- B. Scrub the floor with a neutral detergent solution to remove black marks and excessive soil. Thoroughly rinse and allow to air dry. DO NOT wash floor until time period recommended by luxury vinyl tile and moisture vapor emission control manufacturers has elapsed to allow luxury vinyl tile flooring to become well sealed in adhesive.
- C. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by luxury vinyl tile manufacturer.
- D. Protect flooring against damage during construction period to comply with luxury vinyl tile flooring manufacturer's directions.

- E. Protect flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishing across floors.
- F. Cover flooring with un-dyed, untreated building paper until inspection for Substantial Completion.

**END OF SECTION 096519.23**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Recycled Rubber Flooring
- B. Related Sections:
  - 1. Section 090561.13 – Moisture Vapor Emission Control
  - 2. Section 096513 – Resilient Base and Accessories for resilient base.

## 1.03 STANDARDS

- A. ASTM D 2047 – “Standard Test Method for Static Coefficient of Friction Polish-Coated Floor Surfaces as Measured by the James Machine”.
- B. ASTM E 648 – “Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source”.
- C. NFPA 253 – “Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source”.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 – Submittal Procedures.
- B. Pursuant to Section 016000 – Product Requirements.
- C. Product Data: Manufacturer’s descriptive literature for specified flooring tiles; include documentation of conformance to specified requirements.
- D. Shop Drawings: Dimensioned plans, to scale, indicating layout of flooring tiles in areas to receive them.
- E. Selection Samples: Two sets of color chips representing manufacturer's full range of available flooring colors.
- F. Verification Samples: Two samples, minimum size six inches (6”) (152 mm) square, representing actual color and finish of flooring to be installed
- G. Quality Assurance Submittals: Manufacturer’s printed installation instructions; include product storage requirements.
- H. Qualifications: Manufacturer and Installer qualifications.
- I. Contract Closeout Submittals:
  - 1. Manufacturer’s recommendations for cleaning and maintaining flooring.
  - 2. Warranty documents specified in WARRANTY Article of PART 1 of this section.

## 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer: Minimum five (5) years-documented experience producing flooring like those specified in this section.
  - 2. Installer: Minimum three (3) years documented experience installing flooring like those specified in this section.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store flooring in manufacturer's unopened packing until installation.
- B. Maintain storage area conditions for flooring in accordance with manufacturer's instructions until installation.
- C. Do not store flooring outside.
- D. Do not store unprotected flooring under fluorescent lighting for period longer than 30 calendar days; cover flooring with dark color polyethylene sheeting or other light-protecting covering.

## 1.07 PROJECT CONDITIONS

- A. Field Measurements: When project conditions permit, take field measurements of areas to receive flooring tile; note discrepancies on submitted shop drawings.
- B. Install rubber flooring after other finishing operations, including painting, have been completed.

## 1.08 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard five (5) year warranty against defects in product and excessive degradation.

## 1.09 EXTRA MATERIALS

- A. Tiles Extra Materials: Supply Twelve (12) full tile in addition to any field cut tile that are larger than half a tile.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS - TILES

- A. Burke Flooring Products, 2250 South Tenth St., San Jose, CA 95112. Phone: 800-447-8442.
- B. Architect approved equivalent.

## 2.02 RECYCLED RUBBER FLOORING - TILES

- A. Burke EcoFitness Flecksibles Interlocking Tiles, 28.5" x 28.5" x .375".
  - 1. Weight: 11.28 lbs./tile
  - 2. EPDM colored chips: 17%
  - 3. Color: As selected by Architect
- B. Adhesive:
  - 1. As recommended by flooring manufacturer.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that sub-floors to receive flooring are level to within flooring manufacturer's requirements, and without large cracks, depressions, or indentations.
- B. Installer's Examination:
  - 1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
  - 2. Transmit two (2) copies of installer's report to Architect within 24 hours of receipt.
  - 3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
  - 4. Beginning construction activities of this section indicates installer's acceptance of conditions.

## 3.02 PREPARATION

- A. Sand any ridges on cement based patching compounds to avoid telegraphing through flooring.
- B. All expansion joints or saw cuts must be filled with an approved cement based patching compound. Patch per manufacturer's instructions and allow to dry thoroughly.
- C. Mechanically remove any traces of old adhesives, paint or other debris.
- D. Clean base to be free of dust, dirt, grease, paint sealers or any other substance that may inhibit proper adhesion.
- E. Remove dust, debris, moisture, and powder accumulations from surfaces to receive flooring.
- F. Concrete slab shall have been cured for a minimum of 30 days and have smooth steel trowel finish.
- G. Provide moisture vapor emission control in accordance with Specification Section 090561.13

## 3.03 INSTALLATION

- A. Recycled Rubber Flooring Installation: Comply with manufacturer's installation manual for procedures and techniques for recycled rubber resilient flooring installation using the full adhesive method for installation.
- B. Take special precaution to avoid damaging the moisture vapor emission membrane and tape system.

## 3.04 CLEANING

- A. Cleaning immediately prior to Owner occupancy:
  - 1. Remove temporary coverings and protection of adjacent work areas.
  - 2. Repair or replace damaged installed products.
  - 3. Clean installed products in accordance with manufacturer's instructions.
  - 4. Remove construction debris from project site and legally dispose of debris.
  - 5. Apply finish material in accordance with manufacturer's instructions.



3.05 PROTECTION

- A. Protect installed products of this section from damage to function or finish by subsequent construction activities.
- B. Repair minor damage to finish in accordance with manufacturer's recommendations.
- C. Replace products having damage to function, and products having damage to finishes which cannot be repaired to Architect's acceptance.

**END OF SECTION 096566**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Provide labor and materials for a seamless, self-leveling broadcast, urethane flooring system, including surface preparation, base coats, and finish coats.

## 1.02 RELATED SECTIONS

- A. Concrete - Division 03
- B. Thermal & Moisture Protection - Division 07

## 1.03 SUBMITTALS

- A. Samples - 3 inch square sample of the proposed system. Color and texture shall be representative of overall appearance of finished system. Final color selections and textures shall be as approved by the Architect.
- B. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
- C. Approved Installer, who has technical qualifications, currently approved in writing, and facilities to install specified systems as well as all necessary certifications in Dur-A-Flex, Inc. application techniques and procedures. Installer must have a minimum of 3-years experience installing this system. Projects must be similar in size and scope to this project.
- D. Applicator must submit all procedures, descriptions of preparation, type of equipment to be used and application procedures.
  - 1. List of at least three (3) references including locations, contact names and contact numbers where this system has been installed. Size and scope of projects to be similar systems.
- E. Relative Humidity test results must be submitted to architect and approved by the manufacturer in writing prior to installation.
- F. All personnel onsite must provide certificates of completing a respiratory training class by a certified instructor and be OSHA 10 certified. All personnel must provide medical clearance to use appropriate respirators where necessary.
  - 1. Provide copies of OSHA 10 cards for all employees working on site.
- G. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.

## 1.04 PREINSTALLATION CONFERENCE

- A. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Store material in a dry, enclosed area protected from the elements. Keep temperature of storage area between 60 degrees and 85 degrees F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

- B. Packing and Shipping
  - 1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
- C. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Cure new concrete no less than 14 days or until required moisture content and Relative Humidity ranges have been met. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
- B. Verify that substrate is properly equipped with vapor barriers and perimeter drains.
- C. Verify supply of adequate utilities, including electric, water, heat (between 50 degrees and 85 degrees F.) and lighting of no less than 80 fc (footcandles) measured at floor surface.
- D. Clear work area of other trades and other traffic during, and for a minimum of 72 hours, after floor installation.

#### 1.07 SAFETY REQUIREMENTS

- A. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
- B. "No Smoking" signs shall be posted at the entrances to the work area.
- C. Non-related personnel in the work area shall be kept to a minimum.

#### 1.08 WARRANTY

- A. Submit a three (3) year Standard manufacturer's warranty against defects in material upon substantial completion of installation. Warranty not to exclude moisture or vapor drive.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURER

- A. Hybriflex EB – Nominal ¼" Urethane Mortar Hybrid System as manufactured by Dur-A-Flex, Inc. Telephone: 800-253-3539, Contact David Hughes, email davidh@dur-a-flex.com.
- B. Manufacturer of Approved System shall be single source and made in the USA.
- C. Architect approved equivalent.

#### 2.02 SYSTEM DESCRIPTION

- A. Nominal 1/4 inch Hybriflex EB, multiple-component, seamless, urethane flooring system. A urethane-urea-cementitious self-leveling mortar with broadcast quartz, plus additional epoxy coat with additional broadcast with 1 finish epoxy and 1 finish urethane hi-performance top coat.
- B. \*For concrete slab applications, system must be able to withstand substrate moisture levels up to 92% RH (tested Relative Humidity) and up to 12 pounds of moisture vapor transmission. (tested by the calcium chloride method). Relative humidity testing and calcium chloride testing

must be performed and be found to meet manufacturer's requirements for installation prior to application of the system.

- C. Cove base to be installed where indicated on the drawings (min 6" high) and as per manufacturers standard details unless otherwise noted

## 2.03 PHYSICAL PROPERTIES

| Physical Property                                                    | Test Method            | Result                                                                                                              |
|----------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------|
| Hardness (Shore D)                                                   | ASTM D2240             | 75-80                                                                                                               |
| Compressive Strength                                                 | ASTM D695<br>ASTM C579 | 17,500 psi<br>12,500 psi                                                                                            |
| Tensile Strength                                                     | ASTM D638<br>ASTM C307 | 4,000 psi<br>2,600 psi                                                                                              |
| Tensile Elongation                                                   | ASTM D638              | 7.50%                                                                                                               |
| Flexural Strength                                                    | ASTM D790<br>ASTM C580 | 6,250 psi<br>4,500 psi                                                                                              |
| Flexural Modulus of Elasticity                                       | ASTM D790              | 6.2 x 10 <sup>5</sup>                                                                                               |
| Linear Shrinkage                                                     | ASTM D2566             | 0.02%                                                                                                               |
| Coefficient of Linear Expansion                                      | ASTM D696              | 2 x 10 <sup>-5</sup>                                                                                                |
| Bond Strength to Concrete                                            | ASTM D4541             | 400 psi substrate fails                                                                                             |
| Indentation                                                          | ML D3134               | 0.025 MAX                                                                                                           |
| Impact Resistance                                                    | ML D3134               | Pass                                                                                                                |
| Water Absorption                                                     | ASTM D570              | 0.04%                                                                                                               |
| Heat Resistance Limitation                                           |                        | 140°F - 200°F                                                                                                       |
| Flammability                                                         | ASTM D635              | Self-Extinguishing                                                                                                  |
| Flame Spread/NFPA 101                                                | ASTM E84               | Class B                                                                                                             |
| Critical Radiant Flux                                                | ASTM E648              | Class 1                                                                                                             |
| Noise Reduction Coefficient                                          | ASTM C423              | 0.05                                                                                                                |
| Taber Abrasion Resistance A&B<br>CS-17 wheel 1000g Load, 1000 Cycles | ASTM D4060             | <b>Gloss Finish</b> <b>Satin Finish</b><br>w/ grit - 4 mg loss      8mg loss<br>no grit -10 mg loss      12 mg loss |
| Static Coefficient of Friction                                       | <u>ANSI B101.1</u>     | >0.6                                                                                                                |
| Dynamic Coefficient of Friction - Wet                                | <u>ANSI A326.3</u>     | >0.42                                                                                                               |
| VOC Content                                                          |                        | 80-90 g/L *                                                                                                         |

### A. PRODUCT MIXING

- Mix on site with mix and measure apparatus to ensure a timely, accurate mix ratio and to minimize waste.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Sealers and curing agents are not to be used.

- B. Create a surface profile with a steel shot blast machine and/or dust-free diamond grinders for flooring and edges. Saw cut ¼ inch x ¼ inch keyway in floor around all perimeter walls and recessed equipment edges.
- C. Verify that surface is dry and perfectly clean, free of oil, grease, detergent film, sealers and/or curing compounds
- D. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
- E. The applicator shall own and operate required surface preparation equipment to ensure proper surface preparation in accordance with the manufacturers specifications and instructions. All work shall be accomplished by the manufacturer approved system installer. The following is a list of surface preparation equipment that must be present at jobsite and available additional preparation if needed. The list includes, but is not limited to, the following: Chemical means of surface preparation are not permitted.
  - 1. 20 inch & 10 inch shot-blasting units that operate with self contained dust collection units.
  - 2. 220 volt walk-behind concrete grinders with dust collection on units.
  - 3. Mobile, self powered 125KW generator to run all necessary equipment. Generator to produce 480 volt, 60 amp, 3 phase electric and 240 volt, 60 amp, 3 phase electric, simultaneously.
  - 4. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
  - 5. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
- F. Work shall be directly supervised at all times by a manufacturer trained and certified jobsite supervisor. The Supervisor shall be trained and certified in all Dur-A-Flex Hybriflex EB preparation and installation procedures.

### 3.02 INSTALLATION

- A. Adhere strictly to Hybriflex EB application techniques..
  - 1. Apply 1/8" Polycrete SL and broadcast to rejection with quartz aggregate and allow to cure. Apply 1 coat of Shopfloor, 100% solid, epoxy with second broadcast of quartz aggregate to achieve nominal ¼ inch thickness.
  - 2. Remove excess quartz broadcast, sand or stone and any high spots as directed by the Architect.
  - 3. Apply one finish coat of Shopfloor resin and one coat of Armortop high-performance top coat with a coverage rate of 500 sf/gal.
- B. DETAILS
  - 1. Thoroughly route and vacuum moving cracks and joints, then fill with flexible joint filler.
  - 2. Pre-patch non-moving surface deviations with patching compound comprised of Urethane cement patch filler, Dur-A-Tex UM by Dur-A-Flex, Inc.
  - 3. "Key in" or route all drain edges, perimeter joints and transition points to terminate at full thickness.
  - 4. Install a 6 inch integral cove base at all perimeter walls, wing and intermediate walls, locker and equipment bases as indicated on the drawings using Polycrete WR cove resin, by Dur-A-Flex, Inc.

**3.03 FIELD QUALITY CONTROL**

- A. Tests, Inspection
  - 1. The following tests shall be conducted by the Applicator:
    - a. Temperature
      - 1) Air, substrate temperatures and, if applicable, dew point.
    - b. Coverage Rates
      - 1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

**3.04 CLEANING AND PROTECTION**

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
  - 1. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

**END OF SECTION 096714**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Agreement, including General and Supplementary Conditions, and Divisions 01 of the Project Manual, apply to work of this section.

## 1.02 SUMMARY

- A. This Section includes prefinished polyester glass reinforced plastic sheets (FRP) and associated trim pieces adhered to unfinished gypsum wall board, at locations as indicated on Contract Drawings.
- B. Related Sections include the following:
  - 1. Section 079200 - Sealants.
  - 2. Section 092116 - Gypsum Board Assemblies.
  - 3. Section 096513 - Resilient Base and Accessories

## 1.03 STANDARDS

- A. All work of this Section shall conform to industry standards and/or manufacturer's recommendations.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016100 - Product Requirements.
- C. Product Data: Submit manufacturer's data to indicate compliance with these specifications including:
  - 1. Catalogue cuts including adhesive product data accessory trim and molding sizes and shapes.
  - 2. Storage, handling and preparation instructions and recommendations.
  - 3. Installation instructions.
- D. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- E. Selection Samples: Submit manufacturer's color and pattern selection samples representing manufacturer's full range of available colors and patterns.
- F. Samples of each selected color and pattern:
  - 1. Plastic Panels: Two (2) 12-inch square samples or larger if necessary showing complete pattern repeat in selected color. Provide samples for each different color and/or pattern selected.
  - 2. Accessories and Moldings: 12 inches long, full section, each type.
- G. Maintenance Data: Deliver 2 copies, covering the installed products.

## 1.05 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
  - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
    - a. Wall Required Rating – Class C.

- B. Sanitary Standards: System components and finishes to comply with:
1. United States Department of Agriculture (USDA) / Food Safety & Inspection Services (FSIS) requirements for food preparation facilities, incidental contact.
  2. Food and Drug Administration (FDA) 2013 Food Code 6-101.11.
  3. Canadian Food Inspection Agency (CFIA) requirements.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver panels with protection sheets intact on exposed finished surfaces. Deliver accessories in original, unopened containers.
- B. Storage and Protection: Store materials lying flat in a manner to prevent soiling. Protect materials from physical damage and wetting.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Requirements: Comply with manufacturer's written recommendations regarding environmental conditions under which materials can be installed.

#### 1.08 WARRANTY

- A. Furnish one-year guarantee against defects in material and workmanship.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Marlite, 1 Marlite Drive, Dover, Ohio 44622; Phone: 800-377-1221
- B. Architect approved equivalent offering a precision grid, Class C FRP in colors and patterns equal to or greater than specified product.

#### 2.02 MATERIALS

- A. Plastic Panels: Glass-fiber reinforced polyester plastic panels; ASTM D 3481, USDA accepted.
1. Minimum Physical Properties for Class C (III) Panels:

| PROPERTY                                      | TYPICAL VALUE      | TEST METHOD |
|-----------------------------------------------|--------------------|-------------|
| Flexural strength (PSI)                       | $0.9 \times 10^4$  | ASTM D 790  |
| Flexural modulus (PSI)                        | $6.0 \times 10^6$  | ASTM D 790  |
| Tensile strength (PSI)                        | $11.5 \times 10^3$ | ASTM D 638  |
| Tensile modulus (PSI)                         | $0.45 \times 10^6$ | ASTM D 638  |
| Impact strength (IZOD) (ft. lbs./in. notched) | 6.0                | ASTM D 256  |
| Barcol hardness                               | 28                 | ASTM D 2583 |
| Mold & Mildew                                 | Pass               | ASTM D 3273 |
| Water absorption (percent)                    | 0.15               | ASTM D 570  |
|                                               |                    |             |
|                                               |                    |             |

2. Fire Rating: Class C.
3. Nominal Thickness: 0.090 inch nominal.



4. Finish: Scored pattern from manufacturer's Blue Sky™ Tile & Mosaics Library with Sani-Coat finish.
  5. Color: As selected by Architect from manufacturer's standard classic, checkerboard, accent and Blue Sky™ Tile & Mosaics colors.
- B. Accessories and Moldings: One-piece, anodized, thickness to match plastic panels and plastic boards.
- C. Adhesive & Sealant: Plastic panel manufacturer's standard or recommended high strength waterproof adhesive for substrate involved.

### 2.03 PRODUCT

- A. Symmetrix™ with BlueSky™ Advanced Finishing.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install the Work of this Section in accordance with the manufacturer's printed instructions, except as shown or specified otherwise.
- B. Install moldings and trim plumb and level, within 1/8 inch in any 8 feet of length, in longest lengths practicable. Install division bars between panels in the same plane, inside corners at interior junctures, outside corners at external corners, and cap at top of panels and where panels abut dissimilar materials.
1. Attach moldings and trim to substrate with concealed fasteners spaced not more than 2 inches from ends and 12 inches on center.
  2. Apply a continuous bead of Type 1D sealant to one side of channel trim piece. Install trim piece on leading edge of panel. Apply a continuous bead of Type 1D sealant to exposed channel and install the next panel. Continue in this manner until installation is complete.

### 3.02 CLEANING

- A. Remove dirt and other foreign substances from exposed surfaces in accordance with manufacturer's printed cleaning instructions.

## END OF SECTION 097720

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Surface Preparation.
  - 2. Extent of painting work is shown on drawings and schedules, and as herein specified.
  - 3. The Work includes painting and finishing of all interior and exterior work, except as otherwise indicated.
  - 4. Special painting items include but are not limited to: exterior steel lintels; exposed ductwork, pipes, and conduits; and exposed structural and miscellaneous steel.
  - 5. Stencil painting fire rated and/or smoke tight wall assembly identification.
- B. Work Not Included
  - 1. Prefinished Materials: Including floor finishes, prefinished ceiling components, cement board siding, brick, ACMU, cast stone, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, and bronze and other products furnished with factory finishes unless otherwise indicated.
  - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 042200 - Concrete Unit Masonry.
  - 2. Division 05 - Metals
  - 3. Section 062000 - Finish Carpentry
  - 4. Section 079200 - Sealants.
  - 5. Section 081113 - Hollow Metal Doors & Frames
  - 6. Section 083113 - Access Doors and Frames
  - 7. Section 092900 – Gypsum Board

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM D16 "Standard Terminology for Paint, Related Coatings, Materials, and Applications".
- C. ASTM D4214 "Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films".
- D. ASTM D660 "Standard Test Method for Evaluating Degree of Checking of Exterior Paints".
- E. ASTM D661 "Standard Test Method for Evaluating Degree of Cracking of Exterior Paints".
- F. ASTM D714 "Standard Test Method for Evaluating Degree of Blistering of Paints".
- G. ASTM D5324 "Standard Guide for Testing Water-Borne Architectural Coatings".
- H. ASTM D3170 "Standard Test Method for Chipping Resistance of Coatings".

- I. SSPC - SP 1 "Solvent Cleaning".
- J. SSPC - SP 2 "Hand Tool Cleaning".
- K. SSPC - SP 3 "Power Tool Cleaning".
- L. SSPC - SP 13/NACE No. 6 "Surface Preparation for Concrete".
- M. EPA-Method 24.
- N. OTC (Ozone Transport Commission) Regulation No. 41.

#### 1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures:
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Manufacturer's Literature: Material description and application instructions for each type of material specified or required.
- D. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples ("drops") of each color and finish used.
- E. Manufacturer's latest array of full line of colors (color fans).
- F. For materials to receive stain & polyurethane provide two samples of each selected stain color on each wood species being used.
- G. Submit OTC (Ozone Transport Commission) lower VOC compliant products only. Colorant/Tint used in coatings shall add no additional VOC to final product.
- H. Provide Manufacturer Safety Data Specs (MSDS).

#### 1.05 QUALITY ASSURANCE

- A. Experienced workmen familiar with the work shall perform all work of this section according to manufacturers' recommendations and/or industry standards.
- B. Provide materials only in factory sealed and labeled containers. Reuse of any containers for any reason is prohibited and will result in work not being acceptable.
- C. Unless specified, or Architect approved to the contrary, provide all coating materials from same manufacturer.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

- C. Receive paint materials only in unopened, original containers with labels intact. Store materials on site in an approved location. When so ascertained, remove immediately from job site all damaged or otherwise defective material.
- D. Provide labels on each container with the following information:
  - 1. Name or title of product.
  - 2. Manufacturer's color identification code
  - 3. Manufacturer's stock number.
  - 4. Manufacturer's name.
  - 5. VOC Content.
  - 6. Batch Date.
  - 7. Contents by volume, for major pigment and vehicle constituents.
  - 8. Thinning instructions.
  - 9. Application instructions.

#### 1.07 PROJECT/SITE CONDITIONS

- A. Environmental conditions can be modified only if such requirements are a part of manufacturer's published application instructions.
- B. Apply paint materials only when surface and air temperatures are above 50 degrees F for 48 hours before, during, and after the paint application.
- C. Do not apply exterior paint or stain during rain, snow, or damp weather.
- D. Do not apply paint in direct sunlight.
- E. Apply paint materials only when relative humidity is lower than 85% and surface temperature is at least 5 degrees F above dew point.
  - 1. Conditions must remain acceptable to manufacturer's recommendations during drying time.
- F. Apply paint only to surfaces that are free of surface moisture.
- G. Do not apply paint in areas with airborne dust or where dust can be generated.

#### 1.08 SAMPLING OF MATERIALS

- A. Samples of materials being used on the job may be taken at any time at discretion of Architect and checked for compliance to these specifications.

#### 1.09 EXTRA STOCK

- A. Provide 1 gallon of each separate color and finish product used on Project.
- B. Label each container with color, texture, sheen, and room designation, in addition to manufacturer's unobstructed label.

#### 1.10 DEFINITIONS

- A. Conform to ANSI/ASTM D16 for interpretation of terms used in this Section.
- B. The term "Paint", as used herein, includes enamels, paints, sealers, fillers, emulsions, stains, varnishes and other coatings whether used as prime, intermediate, or finish coats.

- C. "MDF" equals minimum dry film thickness. The numbers specified denote the thickness of each coat.
- D. "Properly Painted Surface" - A surface that is uniform in appearance, color, sheen, and without telegraphing of any portion of the substrate. It is one that is free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, or insufficient coverage. It is a surface that is free of drips, spatters, spills, or overspray which a Contractor's workforce may cause. Compliance to meeting the criteria of a "Properly Painted Surface" shall be determined by the Architect when viewed without magnification at a distance of five (5) feet or more under normal lighting (both daylight and artificial) conditions and from a normal viewing position.

#### 1.11 EPOXY PAINT SAMPLE

- A. Four samples of 8x16 CMU of the Type to be painted with epoxy wall paint shall be painted with the approved block filler to demonstrate the level of block filler to be applied. Two of the four CMU shall then be painted with the approved number of coats of epoxy paint in the color selected for the project. Architect and Owner shall approve painted block samples prior to beginning epoxy paint.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. General Architectural Coatings
    - a. Benjamin Moore & Co.
    - b. Sherwin Williams Company.
    - c. Architect Approved Equivalent.
- B. Provide products specifically formulated for geographical area in which Project is located.
- C. MPI Standards: Provide products that comply with MPI standards and that are listed in its "MPI Approved Products List".

#### 2.02 COLORS

- A. Selection: by Architect from manufacturer's full range.
- B. Proprietary names used to designate colors or materials are not intended to imply that products of those manufacturers are required to the exclusion of Architect approved equivalent products of other manufacturers - unless noted otherwise.

#### 2.03 COATING SYSTEMS

- A. Gypsum board - General Office Area (dry environment)
  - 1. Sherwin Williams
    - a. Drywall Primer: USG Sheetrock Brand First Coat Primer DFT 0.9-1.2
    - b. Paint Primer: ProMar 200 Zero VOC Primer; MDF 1.5
    - c. Two coats: ProMar 200 Zero VOC Low Sheen Eg-Shel; MDF 1.6
    - d. Total System: MDF 4.7
  - 2. Benjamin Moore
    - a. Drywall Primer: USG Sheetrock Brand First Coat Primer DFT 0.9-1.2
    - b. Paint Primer: Eco Spec WB Latex Primer Sealer (372); MDF 1.2
    - c. Two coats: Eco Spec WB Latex Sheen Eggshell (374); MDF 1.4 per coat

- d. Total System: DFT 3.5 - 4.0.
- B. Ferrous metals, shop primed (flat and gloss, solvent base)
  - 1. Sherwin Williams
    - a. Primer: Pro Industrial Pro-Cryl Universal Primer (B66-310);
    - b. MDF 2.0-4.0
    - c. Two coats: Pro Industrial Acrylic Semi-Gloss; MDF 2.5 per coat
    - d. Total System: MDF 7.0 - 9.0
  - 2. Benjamin Moore
    - a. Primer: Alkyd Metal Primer (P04); MDF 2.0
    - b. Two coats: Super Spec HP DTM Acrylic High Gloss (P28); MDF 2.0 per coat
    - c. Total System: DFT 6.0
- C. Wood, painted (semi-gloss, water base)
  - 1. Sherwin Williams
    - a. Primer: PrepRite Premium Wall and Wood Primer MDF 1.4
    - b. Two coats: ProMar 200 Zero VOC Semi-Gloss MDF 1.6
    - c. Total System: MDF 4.6
  - 2. Benjamin Moore
    - a. Primer: Eco Spec WB Latex Primer Sealer (372); MDF 1.2
    - b. Two coats: Eco Spec WB Latex Semi-Gloss (376); MDF 1.5 per coat
    - c. Total System: DFT 3.5 - 4.5
- D. Wood, finished (semi-gloss, solvent base and stain)
  - 1. Sherwin Williams
    - a. Primer: follow manufacturer's instructions for wood grain filler and/or wood conditioner
    - b. First Coat: Minwax 250 VOC Stains
    - c. Second & Third Coat: Wood Classics Waterborne Satin Varnish (A68) MDF 1.3 per coat
    - d. Total System: MDF 2.6
  - 2. Benjamin Moore
    - a. Primer: follow manufacturer's instructions for wood grain filler and/or wood conditioner
    - b. First Coat: Benwood Interior Wood Finishes, Polyurethane Low Lustre (435); MDF 1.0 - 1.2
    - c. Second & Third Coat: Benwood Interior Wood Finishes, Polyurethane Low Lustre (435); MDF 1.0 - 1.2 per coat
    - d. Total System: MDF 3.0 - 3.6
- E. Interior CMU (Paint)
  - 1. Sherwin Williams
    - a. First Coat: Pro Industrial HD Block Filler (B42W00150) MDF 8.0
    - b. Two Coats: ProMar 200 Zero VOC Eg-shel (B20W12651); MDF 1.6
    - c. Total System: MDF 11.2-12.0
  - 2. Benjamin Moore
    - a. First Coat: Moorecraft Super Craft Latex Block Filler (285), MDF 8.1-11.0
    - b. Two Coats: Eco Spec WB Latex Eggshell (374); MDF 1.4 per coat
    - c. Total System DFT: 12.0 - 13.5
- F. Interior CMU (Epoxy, Semi-Gloss)
  - 1. Sherwin Williams
    - a. First Coat: Loxon Block Surfacer (A24W200) MDF 8.0
    - b. Two Coats: Water Based Catalyzed Epoxy (B70W00211) MDF 2.8 per coat
    - c. Total System: MDF 13.0-14.0

2. Benjamin Moore
  - a. First Coat: Moorecraft Super Craft Latex Block Filler (285); MDF 9.0 - 11.00
  - b. Two Coats: Super Spec Acrylic Epoxy Semi Gloss (256-86) MDF 1.5 per coat
  - c. Total System: MDF 12.0 - 13.5
- G. Apparatus Bay Ceiling for Exposed Structure and Accessories. Surface Prep SSPC-SP1
  1. Sherwin Williams
    - a. First Coat: Waterborne Acrylic Dryfall Eg-shell (B42W2) MDF 3.0
    - b. Second Coat: Waterborne Acrylic Dryfall Eg-shell (B42W2) MDF 3.0
    - c. Total System: MDF 6.0 - 7.5
  2. Benjamin Moore
    - a. First Coat: Acrylic Metal Primer (P04), MDF 1.5 - 2.5
    - b. Second Coat: Super Spec Sweep Latex Flat (153), MDF 2.0
- H. Ferrous Metal hidden from view (e.g. - back side of door frames, lintels, etc.);
  1. Sherwin Williams
    - a. One Coat: Pro Industrial Pro-Cryl Universal Primer (B66-310);
    - b. MDF 2.0-4.0
  2. Benjamin Moore
    - a. One Coat: Acrylic Metal Primer (P04), MDF 1.5-2.5
- I. Apparatus Bay and Exterior Apron Painted Guide Stripe on Concrete Floor, Hardened Concrete Floor, or Polished Concrete Floor (Must mechanically prep areas to receive traffic marking)
  1. Watco
    - a. One Coat: Anti Slip Traffic Paint,

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
  1. Gypsum Wallboard: 12 percent.
  2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
  3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

### 3.02 GENERAL PREPARATION (ALL SUBSTRATES)

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.

### 3.03 CONCRETE AND CMU PREPARATION

- A. Remove all surface dust, dirt and other contaminants by brooming, air blast, or vacuum cleaner.
- B. Remove form release agents, laitance, dirt and other contamination, as required by coatings manufacturer, by using a light blast with fine silica sand.
- C. Obtain allowable moisture content level from coatings manufacturer. Determine moisture content by means of a moisture meter designed specifically for concrete and operated by a qualified inspector. Apply coatings only after all conditions conform to published requirements of coating manufacturer.

### 3.04 GYPSUM BOARD SURFACE PREPARATION

- A. Do not use linseed oil putty, glazing materials, patching pencils, caulking, or masking tape on surfaces to be painted.
- B. Sand and dust as necessary.
- C. Remove all dust, dirt, powdery residue, grease, oil, wax, or any other contaminants.
- D. Spot prime defects after repair.

### 3.05 FERROUS METAL SURFACE PREPARATION

- A. Shop Primed
  - 1. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
  - 2. Remove oils and lubricants by using mineral spirits or xylol solvents. Change applicators frequently to avoid recontamination. Execute pursuant to SSPC SP-1.

### 3.06 GALVANIZED METAL SURFACE PREPARATION

- A. Remove oils, greases, and waxes by using appropriate solvents. Change applicators frequently to avoid recontamination. Execute pursuant to SSPC SP-1.
- B. Remove water-soluble contaminants by washing with water.

### 3.07 WOOD SURFACE PREPARATION

- A. Remove oil and grease by using mineral spirits or xylol. Change applicators frequently to avoid recontamination.
- B. Seal defects such as knots, resins, gum pockets, or extractives by using a mixture of equal parts of shellac and alcohol.
- C. Remove mildew by scrubbing with a solution of 1 tablespoon of dry powdered laundry detergent with 1 quart of hypochlorite type household bleach to 3 quarts of warm water. After scrubbing, rinse thoroughly with clean water.
- D. Fill nail holes, cracks, or other surface defects by using putty. Where stained or clear finishes will be applied, use putty that is colored to match natural color of the unfinished wood.
- E. Back prime all trim, bases, casing, and finish lumber prior to installation.



- F. Apply two (2) coats of primer on all redwood or cedar where paint will be applied.
- G. Sand and dust as necessary.

### 3.08 INTERIOR POLYURETHANE MOLDINGS, TRIM AND EXTERIOR SYNTHETIC TRIM

- A. Follow manufacturers recommended surface preparation requirements.
- B. Fill nail holes, cracks, joints between pieces, or other surface defects by using putty or material as recommended by molding and/or trim manufacturer. Sand all patched areas smooth.

### 3.09 APPLICATION

- A. Beginning of installation means acceptance of existing surfaces.
- B. Apply paint pursuant manufacturer's directions. Use applicators and techniques best suited for type of material being applied.
- C. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- D. On GWB walls with suspended acoustical ceilings, apply primer and first coat of finish paint prior to ceiling grid installation. Extend these two coats 4" above ceiling line.
- E. Sand lightly between each succeeding enamel or varnish coat.
- F. Spray Painting: allowable interiors to be approved by the Architect. Limit spray-painting on interior surface to acoustical plaster (if any) and service spaces such as mechanical equipment rooms.
- G. Minimum coating thickness: apply each material at not less than manufacturer's recommended spreading rate.
- H. Prime coats: apply a prime coat if specified to material which is required to be painted or finished, and which has not been prime coated.
- I. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Roller Applications: roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- K. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections are not acceptable. Cut in sharp lines and color breaks.
- L. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
- M. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint Work not in compliance with specified requirements.

## 3.10 INCLUSIONS

- A. Paint all surfaces specified, scheduled, illustrated, and otherwise exposed to view except those items or surfaces specifically noted.
- B. Paint all exposed exterior and interior piping, bollards, frames, conduit, ductwork, steel grilles, and related fittings identical with room or ceiling color or adjacent surfaces unless specifically noted otherwise. This includes all conduit, ductwork and piping in the Apparatus Bays and adjacent rooms.
- C. Finish recesses same as adjoining rooms. Finish all other surfaces same as nearest or adjoining surfaces unless specifically noted otherwise.
- D. Paint surfaces behind equipment and furniture same as equal or adjacent exposed surfaces.
- E. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
- F. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.
- G. Paint all hollow metal doors and frames that do not have a factory provided finish.
  - 1. As directed by Architect, hollow metal frames and doors may be different colors on each side of frame and/or door.
  - 2. Finish door tops, bottoms and side edges same as faces, unless otherwise indicated.
  - 3. Hollow metal doors and/or frames may be painted different colors from one side to the other.
- H. Paint all steel bollards, overhead door steel jambs and lintels, all exposed steel structure, galvanized decking, conduit, piping, ductwork and framing in the apparatus bay.
- I. Paint all exterior and interior lintels.
- J. Paint numbers on interior of each overhead door as detailed on Contract Drawings.
- K. Paint metal louvers in wood doors to match door frame.
- L. Paint any exterior trim that does not have a factory provided finish.
- M. Stencil paint in contrasting color "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS" at tops of all fire rated and/or smoke tight walls and or partitions. Lettering must be a minimum 3.0 inches in height, must appear within 15 feet of the end of each wall or partition and at intervals not exceeding 30 feet measured horizontally along the wall or partition.

## 3.11 EXCLUSIONS

- A. Exclude finishing of pre-finished items including but not limited to plastic laminate finished components, metal or plastic toilet partitions, factory finished equipment, acoustical materials, light fixtures, wiring devices, electrical device plates, and fire detection, alarm and suppression devices unless specifically noted otherwise.
- B. Exclude finishing of chases, concealed wall or ceiling spaces, or similar inaccessible spaces unless specifically noted otherwise.

- C. Exclude finishing of anodized or electrostatically painted aluminum, stainless steel, chrome plating, copper, brass, bronze, ceramic tile, quarry tile, stone products, or similar materials with an integral finish unless specifically noted otherwise.
- D. Do not paint over labels or plates containing written or numerical information such as laboratory fire resistivity labels on rated doors and frames and the manufacturer's name and descriptive information on circuit breaker panel covers.
- E. Do not paint over the moving portion of any mechanical or electrical assemblies, sensing devices, and/or fusible links.

### 3.12 PROTECTION OF OTHER WORK

- A. Protect adjacent surfaces, whether to be painted or not, against damage by painting and finishing work. Correct any damages by cleaning, repairing or replacing, and repainting, as directed by Architect.
- B. Coordinate the maintenance and subsequent removal of temporary protective wrappings.

### 3.13 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.
- B. Should telegraphing (photographing) of the substrate and or discoloration of the surface caused by the substrate appear within one (1) year from the date of substantial completion, the Contractor shall repaint the area with matching paint to resolve the telegraphing/discoloration. The Architect shall be the sole judge of the extent of telegraphing and or discoloration.

### 3.14 CLEANING

- A. Daily clean up: During the progress of the Work, remove from the project daily, all discarded paint materials, rubbish, cans and rags.
- B. Properly handle, store, and dispose of all hazardous materials.
- C. Upon completion, clean all glass and other paint--spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage-finished surfaces. Restore all damaged surfaces to their original condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

**END OF SECTION 099100**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Recessed display cases.

## 1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking and supports.
- B. Section 092116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.
- C. Section 092216 - Non-Structural Metal Framing: Concealed supports in metal stud walls.

## 1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.

## 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.
  - 1. Submit color charts for selection by the Architect/Engineer.
- C. Shop Drawings: Submit complete installation details. Include dimensioned elevations.
- D. Samples: Submit samples of material and trim to illustrate finish, color, and texture.
- E. Specimen Warranty.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver display cases and materials to the Project site with manufacturer's protective crate covering and do not open until ready for use.

- B. Protect display cases before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

#### 1.07 FIELD CONDITIONS

- A. Field Measurements: Verify field measurements for recessed application for display cases before preparation of shop drawings and before fabrication to ensure proper installation.

#### 1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against defects and in materials, finish product and workmanship.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Claridge Products and Equipment, Inc; 370 Recessed Display Case:  
[www.claridgeproducts.com/#sle](http://www.claridgeproducts.com/#sle).
- B. Or Approved Equal\_\_\_\_\_.

#### 2.02 DISPLAY CASES

- A. Recessed Display Case: Factory-fabricated wood-framed display case with adjustable glass shelves, finished interior, and aluminum trim on face to cover edge of recessed opening.
  - 1. Width: As indicated on drawings.
  - 2. Height: As indicated on drawings.
  - 3. Depth: As indicated on drawings.
  - 4. Components:
    - a. Glazed Doors: Sliding.
      - 1) Number of Doors: Two pair.
    - b. Side Panels: Laminate-faced substrate.
    - c. Back Panel: Tackable.
    - d. Top Panel: Laminate-faced substrate.
    - e. Bottom Panel: Laminate-faced substrate.
    - f. Lighting: LED.

#### 2.03 COMPONENTS

- A. Aluminum Framed Case Construction: 1-1/2 inch by 2 inch (38 mm by 51 mm) extruded aluminum tube frame with tempered glass and laminate-faced infill panels.
- B. Aluminum Case Construction: Aluminum side, bottom, and top panels fabricated from extruded aluminum shapes.
- C. Face Frame Trim for Recessed Installation: 2 inch (51 mm) flat face dimension extruded aluminum trim mitered with corner clips and mechanical fasteners.
- D. Glazed Sliding Doors:
  - 1. 1/4 inch (6 mm) clear tempered glass with plastic finger pulls.

2. Door track: Extruded aluminum glass shoe with bottom rollers and top plastic guide.
  3. Lock: Glass door cylinder lock.
- E. Glass Shelves:
1. 1/4 inch (6 mm) clear tempered glass with flat-polished edges.
  2. Shelf Depth: 12 inches (305 mm).
  3. Shelves per Unit: Three.
- F. Shelf Standards and Brackets: Single-slotted channel standards for brackets adjustable in 1 inch (25 mm) increments along entire length of standard, drilled and countersunk for screws.
1. Standards Mounting: Recess-mounted into back panel.
  2. Face Width: 5/8 inch (16 mm).
  3. Material: 16 gauge, 0.0598 inch (1.52 mm) sheet steel.
  4. Finish: Anochrome.
- G. Tackable Back Panel: Fine-grained, homogeneous natural cork on hardboard.
1. Cork Thickness: 1/8 inch (3 mm).
  2. Fabric: Vinyl fabric; minimum fabric weight: 13 oz/sq yd (440 g/sq m).
  3. Color, Texture, Weave, and Pattern: As selected from manufacturer's full range.
  4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
- H. Lighting: Manufacturer's standard LED light fixture housed at top of case with louvered aluminum access door with keyed lock.
1. Recessed: Fixture with egg crate diffuser.
  2. Controls: On/Off using dedicated wall switch.

## 2.04 MATERIALS

- A. Aluminum Extrusions for Framing and Trim: Alloy as recommended by manufacturer for construction and specified finish; nominal 1/8 inch (3.2 mm) wall thickness.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.
1. Finish: Factory finished; AAMA 2603: Powder coat; black color.
- C. Heat-Strengthened and Fully Tempered Glass: ASTM C1048, Kind FT.

## PART 3 EXECUTION

### 3.01 PREPARATION

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Locate fastening devices to secure cases securely to back and sides of rough opening.
- C. Install recessed display cases plumb and level in wall openings, 10 inches (\_\_\_\_ mm) from finished floor to inside bottom of display case.
- D. Refer to drawings for display case mounting heights.
- E. Clean case and glass using manufacturers recommended procedures.
- F. Provide mitered and wrapped hairline joints for all trims.

3.03 ADJUSTING AND CLEANING

- A. Verify that all accessories are installed as detailed for each unit.
- B. At completion of work, clean glass surfaces, back panels and trim in accordance with manufacturer's recommendations leaving units ready for use.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

**END OF SECTION 101200**

## PART 1-GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following types of signs;
  - 1. ADA Compliant Interior Room/Door Signage & Specialty Signage.
  - 2. Cast Metal Dedication Plaque.
  - 3. Exterior Wall Mounted Letters and Numbers.
  - 4. Exterior Medallion.
  - 5. Truss Identification Signage.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 01 Section "Temporary Facilities and Controls" for temporary project identification signs.
  - 2. Section 061000 - Rough Carpentry.
  - 3. Division 22 for "Plumbing Identification" for labels, tags, and nameplates for mechanical equipment.
  - 4. Division 23 for "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
  - 5. Division 26 for "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
  - 6. Division 26 for "Interior lighting" for illuminated exit signs.
  - 7. Civil Drawings for exterior traffic control and parking space signage.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. 36 CFR 1191 - American with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- C. ADA Standards - American with Disabilities Act (ADA) Standards for Accessible Design.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Submit samples of each color and finish of exposed materials and accessories required for specialty signs. Submit full range of available fonts for all signage. Architect's review of samples will be for color, texture and fonts only.
- D. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
  - 1. Provide message list for each sign, including large-scale details of wording, lettering, and Braille layout.



2. Any sign, plaque and or medallion containing artwork, it is the responsibility of the manufacturer to re-create artwork (vector graphics will not be provided).

#### 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this section.
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

#### 1.08 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs and/or letters.
  1. For signs and letters supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS & MATERIALS

- A. Interior Room Signs: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  1. Interior Room Signs
    - a. Mohawk Sign Systems, Series 200A, P.O. Box 966, Schenectady, NY 12301-0966. (T) (518) 842-5303; (F) (518) 842-5306.
    - b. Architect Approved Equivalent
  2. All signs shall be manufactured using Graphic Process Series 200A-Sand Carved using Format D.
    - a. Plastic or metal signs with tactile reflective routed lettering. Tactile characters shall be raised the required 1/32-inch from sign face. Glue-on letters or etched backgrounds are not acceptable.
    - b. Grade 2 Braille shall accompany all text. Braille shall be separated 1/2-inch from the corresponding raised characters. Grade 2 Braille translations to be provided by signage manufacturer.
    - c. Architect shall select colors from manufacturer's full range.
    - d. Every door in the project shall have an identifying sign at every door or opening into the room/corridor.
    - e. All signage shall meet ADA and ANSI requirements.
  3. Sign material shall be melamine plastic laminate, approximately 1/8-inch thick

- a. with contrasting core color. The melamine shall be non-static, fire-retardant and
- b. self-extinguishing. The plastic laminate shall be impervious to most acids,
- c. alkalis, alcohol, solvents, abrasives and boiling water.
- 4. Size of letters and numbers shall be as follows:
  - a. Room Number shall be 1-inch high.
  - b. Lettering for Room ID signs shall be ¾-inch high.
  - c. Symbol size shall be 4-inches high.
  - d. Standard Grade 2 Braille shall be ½-inch below copy.
- 5. Letterform shall be Gill Sans upper case.
- 6. Copy Position: CC (centered/centered)
- 7. Sign Size:
  - a. Room Function Signs: 6 inch x 6 inch unless text requires a longer sign.
  - b. Restroom Signs; shall be design ADA-4 size 8-inches x 8-inches with a 4-inch accessibility symbol, gender symbol, and the verbal description placed directly below followed by Grade 2 Braille.
  - c. Corners: Square Edge.

## 2.02 EXTERIOR LETTERS

- A. Available Manufacturers:
  - 1. Gemini Inc. 103 Mensing Way, Cannon Falls, MN 55009, Phone: (800) 538-8377
  - 2. Architect Approved Equivalent.
- B. Material: Cast Aluminum
  - 1. Color: to be selected by Architect.
- C. Size: As shown on Contract Drawings.
- D. Lettering Style: to be selected by Architect
- E. Mounting: Exterior
  - 1. Verify location with Architect and Owner
  - 2. Method: Mount to wall
    - a. Use projected spacer style mounting
- F. Names: Letters to spell out "Name of Fire Department" in all uppercase letters and building numbering as shown on Contract Drawings.

## 2.03 DEDICATION PLAQUE

- A. Available Manufacturers:
  - 1. United States Bronze, 811 Second Avenue, New Hyde Park, NY 11040 Phone: (800) 872-5155
  - 2. Architect Approved Equivalent.
- B. Plaque: Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish and with other requirements shown for thickness, size, shape, and copy. Hand-tool and buff corners and raised copy to produce the manufacturer's standard satin polished finish. Refer to the "Materials" Article for other finish requirements.
- C. Material: Cast Aluminum
  - 1. Lettering, border, texture and background color selected by Architect from manufacturer's full range.

- D. Size: As indicated on Drawings.
- E. Lettering: Raised, BankGothic Md BT, upper and lower case.
- F. Mounting:
  - 1. Verify location with Owner and Architect.
  - 2. Method: Drilled thru to receive screws with rosettes
- G. Names:
  - 1. Refer to Contract Drawings, final layout and wording to be determined at time of submittal.

#### 2.04 EXTERIOR MALTESE

- A. Material: Cast Aluminum - 1 3/4" thick at returns
  - 1. Hand Painted on full color flat relief
- B. Size: As indicated on Contract Drawings.
- C. Lettering Style:
  - 1. Artwork to be supplied by Owner
- D. Mounting: Exterior
  - 1. Verify location with Architect and Owner
  - 2. Method: Mount to masonry wall
    - a. Use two inch projected spacer style mounting

#### 2.05 TRUSS IDENTIFICATION SIGNAGE

- A. Signs identifying the existence of truss construction shall consist of a circle 6" in diameter, with a stroke width of 1/2 inch. The sign background shall be reflective white in color. The circle and contents shall be reflective red in color, conforming to Pantone matching system (PMS) #187. Signs directly applied to a door or sidelight may be a permanent non-fading sticker or decal. Signs not directly applied to doors or sidelights shall be of sturdy, non-fading, weather resistant material.
- B. Quantity: Four decal types
- C. Copy: To be furnished

#### 2.06 SPECIALTY SIGNS

- A. Special Signs
  - 1. Provide the following special signs constructed in the same manner as room identification signage unless noted otherwise, in colors as selected by the Architect. Consult Architect for exact placement location of these signs.
    - a. Two - 12 inch x 12 inch, "In Case of Fire-Use Stairs" with graphics to be located near elevator doors on each floor.
    - b. Two rappelling point load signs (4"x12")
      - 1) Copy to be furnished.
    - c. Thirteen - 8 inch x 11 inch, typical class K fire extinguisher sign (PHASE 2), Three - 8 inch x 11 inch, typical class K fire extinguisher sign (PHASE 1)
    - d. Two - 6 inch x 8 inch, "Maximum Occupancy ##"
    - e. One white reflective aluminum exterior sign with red letters 12"x 12" "FDC" furnish with brass screws for exterior mounting.

- 1) Sign to be composed of an inner polyethylene core sandwiched between two sheets of .008 aluminum.
- 2) Engineer-grade reflective vinyl overlay.
- 3) Visible both day and night.
- f. Two - 8 inch x 20 inch, "NOT AN EXIT" at Door 116A, 112B (Phase 2)
- g. One - 12 inch x 12 inch sign "Authorized Personnel Only"- at doors 123 and 210A (Phase 2)
- h. Floor Level Signs -- In multi-story buildings at stairways provide floor level designation signage.

## 2.07 FASTENERS AND ANCHORS

- A. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- B. Anchors and Inserts: Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions and conformance with ADA.
  1. Install signs level, plumb, and at height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
  1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
  2. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
  3. Exterior signs: Use brass screws at all four corners.
- C. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
  1. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through the face of the plaque into the wall surface.
- D. All signage and subsequent mounting shall comply with ANSI and ADA.
  1. Tactile signage shall be located alongside the door on the latch side
  2. Tactile signage shall be mounted at 60" A.F.F. to the centerline of the sign.
  3. At locations of double doors, tactile signs shall be mounted to the right of the right-hand door.
  4. Where there is no available wall space at the latch side of the door, signs may be placed on the nearest adjacent wall.
- E. Verify all mounting locations with the Architect prior to any work.

3.02 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner and Substantial Completion.

**END OF SECTION 101400**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Phenolic-core toilet compartments configured as toilet enclosures, privacy screens, and urinal screens.
  - 2. Partition Style:
    - a. Floor Anchored / Overhead Braced.
  - 3.

## 1.03 REFERENCES

- A. ASTM (International)
  - 1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 3. ASTM A 743/A 743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
  - 4. ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
  - 5. ASTM B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. International Code Council (ICC)/American National Standards Institute (ANSI):
  - 1. ICC A117.1 - Accessible and Usable Buildings and Facilities, as applicable to toilet compartments designated as accessible.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of cutouts for compartment-mounted toilet accessories.
  - 2. Show locations of reinforcements for compartment-mounted grab bars.
  - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Manufacturer's Warranty: Manufacturer's standard 15-year limited warranty for panels, doors and stiles against breakage, corrosion, delamination and defects in factory workmanship.
  - 1. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

### 1.05 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment, from manufacturer.

### 1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

### 1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years experience in the manufacture of toilet compartments.
- B. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.
- C. Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.
- D. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 30 or less.
  - 2. Smoke-Developed Index: 55 or less.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC A117.1 for toilet compartments designated as accessible.
- F. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:
  - 1. GREENGUARD Indoor Air Quality Certified.
  - 2. GREENGUARD Certified for Children and Schools.

### 1.08 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.
  - 1. Deliver toilet compartments in manufacturer's original packaging.
  - 2. Store in an upright condition.

### 1.10 WARRANTY

- A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:
  - 1. Phenolic Core Toilet Partitions: Against delamination: 3 years.

## PART 2 - PRODUCTS

## 2.01 PHENOLIC-CORE UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products of Bradley Corporation, Mills Metals Division, Menomonee Falls, WI 53051, (800)272-3539, fax (262)251-5817; Email: info@BradleyCorp.com; Website: www.bradleycorp.com or comparable product by one of the following:
  - 1. Bobrick
  - 2. Metpar Corp.
  - 3. Or approved equal
- B. Toilet-Enclosure Style: Floor and Ceiling Anchored (Bradley, Mills Partitions - Series 700)
- C. Urinal-Screen Style: Government-flanged with Wing Bracket (Bradley, Mills Partitions - Model No. 5)
- D. Door, Panel, Screen, Urinal Screen and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with 15-degree eased and polished edges and no-sight line system. Provide 3/4-inch minimum thick doors and pilasters, other panels shall be 1/2-inch thick minimum.
  - 1. Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, telegraphing of core material, or other imperfections.
  - 2. Core Material: Manufacturer's standard solid resin core of thickness required to provide finished thickness for doors, panels and pilasters.
- E. Pilaster Shoes: Fabricated from Type 304 stainless-steel with No. 4 satin brushed finish, not less than 0.031inch nominal thickness and 4 inches high.
  - 1. Provide pilaster with mechanically fastened leveling bar reinforcement with zinc-plated jack bolt for leveling.
- F. Brackets (Fittings):
  - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- G. Phenolic-Panel Finish:
  - 1. Facing Sheet Finish: Two color and pattern in each room.
  - 2. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard dark color core.

## 2.02 MATERIALS

- A. Phenolic Core: Compressed cellulose impregnated with phenolic resins. Provide smooth material, without creases or ripples.
- B. Aluminum Castings: ASTM B26/B26M.
- C. Aluminum Extrusions: ASTM B221.
- D. Brass Castings: ASTM B584.
- E. Brass Extrusions: ASTM B455.
- F. Stainless-Steel Castings: ASTM A743/A743M.



- G. Zamac: ASTM B86, commercial zinc-alloy die castings.

## 2.03 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
1. Material: Stainless steel castings, including stainless steel tamper-resistant fasteners:
- a. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees. Mount with stainless steel through-bolts.
  - b. Latch and Keeper: Manufacturer's standard latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  - c. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Provide wall bumper where door abuts wall. Provide formed L-shaped hook without stop at outswing doors. Mount with stainless steel through-bolts.
  - d. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance-screen doors.
  - e. Door Pull: Standard unit on outside of inswing doors. Provide pulls on both sides of outswing doors.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish. Provide clamps for attachment to pilaster and stainless steel brackets to secure to wall.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

## 2.04 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine work area to verify that measurements, substrates, supports, and environmental conditions are in accordance with manufacturer's requirements to allow installation.
1. Proceed with installation once conditions meet manufacturer's requirements.

### 3.02 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- B. Install toilet partitions and screens in spaces with operating, temperature controlled HVAC systems. Shield partitions and screens from direct sunlight.
- C. Maximum Clearances:
  - 1. Pilasters and Panels: 1/4 inch.
  - 2. Panels and Walls: 3/4 inch.
- D. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- E. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### 3.03 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

### 3.04 FINAL CLEANING

- A. Remove packaging and construction debris and legally dispose of off-site.
- B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

**END OF SECTION 102113.17**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Stainless Steel corner guards.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
  - 1. Section 061000 - Rough Carpentry for blocking within walls.
  - 2. Section 062000 - Finish Carpentry for wood corner guards.

## 1.03 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016100 - Product Requirements
- C. Samples:
  - 1. 6" long sample of each type and style of corner guard.
- D. Color Samples: Manufacturer's standard colors for exposed surfaces.
- E. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions.

## PART 2 PRODUCTS

## 2.01 MATERIALS

- A. Type 304 Stainless Steel Corner Guards: Model CG-2143 (2" legs) by American Floor Products Co., Inc., [www.afco-usa.com](http://www.afco-usa.com) 1-800-342-0424 or Architect approved equivalent.
  - 1. Lengths:
    - a. At Standard Walls: From top of base material to 4' - 0" A.F.F.
    - b. At Walls with Chair Rail: From top of base material to bottom of chair rail
  - 2. Finish: #4 Satin
  - 3. Thickness: 0.05" (16 gauge)
  - 4. Style: L-1 right angle with 1/8" radius
  - 5. Edges: Eased
  - 6. Attachment: Pre-drilled countersunk holes with matching #8 screws included. Hole Spacing: 3" from each end and spaced evenly not to exceed 36" o.c.
- B. Fasteners:
  - 1. Stainless steel or brass tamper resistant screws - Directly into studs or blocking.
  - 2. At locations where there are no studs or blocking use screw anchors, tubular, lead coated, braided fiber screws.

## PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Install the Work of this Section in accordance with the manufacturer's printed instructions and as otherwise specified.

- B. Install on all walls of room indicated on Room Finish Schedule.
- C. Fasten corner guards to walls with screws and anchors in each wing utilizing pre-drilled mounting holes. Space screws not more than 2 inches from ends and not more than 8 inches o.c., unless otherwise indicated.

**END OF SECTION 102613**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. THE ITEMS IN THE SECTION ARE FOR PHASE 2 ONLY
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.
  - 2. Miscellaneous Bathroom Accessories
  - 3. Public-use shower room accessories.
  - 4. Childcare accessories.
  - 5. Underlatory guards.
  - 6. Custodial accessories.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty requirements listed under this section.

## 1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals. Manufacturer's service and parts manual shall be provided to the owner upon completion of project.
- B. All keyed toilet accessories shall be keyed alike. Six keys shall be provided to the Owner.

## 1.06 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts, and anchoring devices set into back-up construction as required to prevent delaying the Work.

## 1.07 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 5 years from date of Substantial Completion for Toilet Accessories and Hand Dryer units. Mirror reflective surfaces shall be warranted for a period of 15 years against silver spoilage.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Stainless Steel: ASTM A666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated. 65-70% post-recycled content.
- B. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.
- C. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- E. Mirrors: ASTM C1048, Tempered Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.02 WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Bobrick Washroom Equipment, Inc.
  - 2. American Specialties, Inc.
  - 3. Bradley Corporation
- B. AC-05 - Toilet Tissue (Roll) Dispensers:
  - 1. Basis-of-Design Product: Bradely 5402.
    - a. Description: Double-roll dispenser
    - b. Mounting: Surface mounted.
    - c. Operation: Unit shall be equipped with two theft-resistant, heavy-duty, one-piece molded spindles.
    - d. Capacity: Designed for up to 5 1/8 inch- diameter tissue rolls.
    - e. Material and Finish: Type 304 Stainless steel, No. 4 finish (satin).
    - f. Lockset: Tumbler type. Keyed alike to all other Toilet Accessories.
- C. AC-12 Recessed Waste Receptacle:
  - 1. Basis-of-Design Product: Bradley Model 346.
    - a. Flange, Skirt shall be fabricated from 18-8, type 304, 22 gauge stainless steel with satin finish. Door shall have double pan back construction.
    - b. Mounting: Surface mounted. Provide stainless steel finishing collar in depth required by wall construction. Provide matching filler channels to fill the gap above tile wainscots on each side and top edge of each unit
    - c. Minimum Waste Receptacle Capacity: 12 gal. (45.4 L) with all handling edges hemmed for safe handling.
    - d. Material and Finish: Type 304 Stainless steel, No. 4 finish (satin).
    - e. Liner: Reusable, vinyl waste-receptacle liner, #P11-004.

- f. Lockset: Tumbler type. Keyed alike to all other locking toilet accessories.
- D. AC-13 Surface Mounted Waste Receptacle:
- 1. Basis-of-Design Product: Bradley Model 356.
    - a. Receptacle shall be fabricated from 18-8, type 304, 22 gauge stainless steel with satin finish and with seamless exposed surfaces.
    - b. Mounting: surface mounted. Provide one piece beveled flange stainless steel finishing collar in depth required by wall construction.
    - c. Minimum Waste Receptacle Capacity: 12 gal. (45.4 L) with all handling edges hemmed for safe handling.
    - d. Material and Finish: Type 304 Stainless steel, No. 4 finish (satin), welded construction.
    - e. Liner: Reusable, vinyl waste-receptacle liner, #P11-006.
- E. AC-14 Surface Mounted Paper Towel Dispenser- SUPPLIED BY OWNER, INSTALLED BY GC:
- 1. Basis-of-Design Product: Georgia Pacific; ENMOTION 10"
    - a. Description: Surface-mounted paper towel dispenser for dispensing rolled paper towels.
    - b. Battery powered, automatic touchless paper towel dispenser
    - c. Mounting: Surface-mounted. Provide concealed backing to comply with local building codes. Secure with sheet metal screws expansion anchors or toggle bolts as required for the wall construction. Mount at height required to meet ADA/Accessible design requirements.
    - d. Lockset: Semi-concealed tumbler type. Keyed alike to all other locking toilet accessories.
- F. AC-11 Liquid-Soap Dispensers: - SUPPLIED BY OWNER, INSTALLED BY GC
- 1. Basis-of-Design Product: Bradley Model No. 6A00-11
    - a. Description: Designed for dispensing soap in liquid or lotion form. Battery powered Automatic Dispenser
    - b. Mounting: surface-mounted.
    - c. Capacity: 27 Fluid oz.
    - d. Materials: Type 304 Stainless steel, 20 gauge, No. 4 finish (satin), welded construction. 22 gauge stainless steel backplate with 20 gauge stainless steel mounting bracket.
    - e. Lockset: Tumbler type. Keyed alike to all other Toilet Accessories.
    - f. Refill Indicator: Unbreakable, clear acrylic refill indicator window.
- G. AC-01,02,03 - Grab Bars:
- 1. Basis-of-Design Product: Bobrick Model B-6806-Series.
    - a. Mounting: Flanges with concealed vandal resistant fasteners.
    - b. Material: Stainless steel, 0.05 inch thick.
    - c. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant, satin-finish texture in grip area.
    - d. Outside Diameter: 1-1/2 inches (38 mm).
    - e. Configurations and Lengths: As indicated on Drawings. Concealed mounting flanges shall be 1/8" thick stainless steel plate, 2" x 3-1/8", and equipped with two screw holes for attachment to wall. Flange covers shall be 22 gauge, 3-1/4" diameter x 1/2" deep, and shall snap over mounting flange to conceal mounting screws and/or wingtip fasteners. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Clearance between the grab bar and wall shall be 1-1/2".
    - f. Grab bars shall comply with barrier-free accessibility guidelines (including ADAAG and ICC 117.1.) for structural strength and configurations.

## H. AC- 07 Sanitary-Napkin Disposal Units:

1. Basis-of-Design Product: Bradley Model 4722-15.
  - a. Mounting: Surface mounted.
  - b. Door or Cover: Drawn, one-piece construction secured with a continuous piano hinge.
  - c. Receptacle: 1.5 gallon capacity.
  - d. Material and Finish: 22 ga. Stainless steel, No. 4 finish (satin).

## I. AC-06 - Toilet Seat Cover Dispenser:

1. Basis-of-Design Product: Bradley Model 583.
2. Mounting: Surface mounted.
3. Capacity: 500 single or half-fold paper toilet seat covers
4. Exposed Material and Finish: 18-8. Type 304, Stainless steel, 22 Ga. No. 4 finish (satin).
5. Lockset: Tumbler type. Keyed alike to all other Toilet Accessories.

## J. AC-09, 10 - Mirror Units:

1. Basis-of-Design Product: Bradley Model 780-2436, 780-3660
  - a. Frame: Type 304 Stainless-steel angle, 0.05 inch (1.3 mm) thick .Mirror shall have a one-piece, type-304 stainless steel angle frame, 3/4" x 3/4" (19 x 19mm) with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror. All exposed surfaces shall have satin finish with vertical grain
    - 1) Corners: Heliarc Welded and ground smooth.
  - b. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
    - 1) One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
    - 2) Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
  - c. Size: As indicated on Drawings. Mounting height to reflective surface at 40" above finish floor for ADA accessible lavatories.
  - d. All mirror edges shall be protected by plastic filler strips and the back shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, 1/4" (5mm) thick polystyrene padding.
  - e. Mirror: 1/4" tempered glass mirror with galvanized steel back.

## 2.03 SHOWER ACCESSORIES

## A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation.

## B. AC-04 - Shower Grab Bars

1. Basis-of-Design Product: Bradley 800 series
2. Diameter: 1-1/2 in.; uniform around curves, peened gripping surface
3. Mounting: concealed with grab bar welded to the mounting flange, mounting flange secured to substrate with stainless steel screws.
4. Escutcheon: Cover plate escutcheon is decorative only.
5. Surface finish: Satin.
6. Configuration: shown on drawings.

## C. AC-15 - Shower Curtain Rod:

1. Basis-of-Design Product: Bradley 9539 series with lengths as required by each shower location as indicated on the drawings.



2. Description: 1 1/4-inch OD; fabricated from nominal 0.05-inch- (1.3-mm-) thick stainless steel.
  3. Mounting Flanges: Stainless-steel flanges designed for concealed fasteners.
  4. Finish: No. 4 (satin).
- D. AC-15 - Shower Curtain:
1. Basis-of-Design Product: Bradley Model 9537 . Provide widths and multiples as required for each Tub/ Shower unit indicated on the drawings.
  2. Size: Minimum 12 inches (305 mm) wider than opening by 72 inches (1828 mm) high.
  3. Material: Vinyl, minimum 0.008 inch (0.20 mm) thick, opaque, matte.
  4. Color: White.
  5. Grommets: Aluminum, corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
  6. Shower Curtain Hooks: Badley Model 9540 stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate the various sizes of Tub/ Shower units indicated on the drawings. Provide one hook per curtain grommet.
- E. AC-17 - L-Shaped Folding Shower Seat:
1. Basis-of-Design Product: Bradley Model 9594 or approved equal.
  2. Configuration: L- shaped seat. Reversible.
  3. Seat: 1 inch thick Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
  4. Mounting Mechanism: Stainless steel, No. 4 finish (satin) 18 gauge 1" diameter tubing with 1½" HDPE support bars
  5. Dimensions: 34.5 inches wide 22 inch depth from wall.
  6. Set seat at 17 to 19 inches above finish floor.
- F. AC-16 - Robe Hooks:
1. Basis of Design Product: Bradley Model 9125 or approved equal.
  2. Surface-mounted accessory shall be fabricated of heavy gauge No. 4 satin
  3. finish stainless steel.
  4. Concealed mounting with three stainless steel set screws.
  5. 300 # downward force capacity.

#### 2.04 CHILDCARE ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brocar Products, Inc.
  2. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.
  3. Or approved equal.
- B. AC-18 Diaper-Changing Stations:
1. Basis-of-Design Product: Koala Kare KB310-SSRE Horizontal Stainless Steel Recessed-Mounted or approved equal.
  2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
    - a. Engineered to support a minimum of 250-lb (113-kg) static load when opened.
  3. Mounting: Surface mounted, with unit projecting not more than 4 inches (100 mm) from wall when closed.
  4. Operation: By pneumatic shock-absorbing mechanism.
  5. Material and Finish: Stainless steel, No. 4 finish (satin), with Grey injection-molded polypropylene with Microban® antimicrobial additive embedded into the bed surface
  6. Liner Dispenser: Built in.

## 2.05 AC-20 BENCHES- PROVIDED BY OWNER, INSTALLED BY GC

- A. Tufftec by Scranton Products, 1 ½ inch thick with edges rounded to ¼" radius solid HDPE.
  - 1. 9 ½" Wide.
  - 2. Quantities and lengths: As per Contract Drawings.
  - 3. Pedestals: Aluminum, 16 inches high, secured to bench tops with stainless steel tamper resistant Torx head screws and secured to the floor with lead expansion shields and 2" long stainless-steel machine bolts.
  - 4. Color as selected by Architect from manufacturer's standard colors.

## 2.06 AC-21 ACCESSIBLE BENCHES- PROVIDED BY OWNER, INSTALLED BY GC

- A. Lyon ADA4220, 5/4" Thick maple hardwood bench.
  - 1. Quantities and sizes: As per Contract Drawings.
  - 2. Pedestals 1 ¼" diameter steel tubing with 10 ga. Flanges, secured to bench tops with stainless steel tamper resistant Torx head screws and secured to the floor with lead expansion shields and 2" long stainless-steel machine bolts. Color as selected by Architect from manufacturer's standard colors.
  - 3. 2" x 2" x ¼" Stainless steel wall angle support full length of Bench less 2". Attach angle to bench and wall with stainless-steel Tamper resistant Torx head screws at 8" o.c.

## 2.07 UNDERLAVATORY GUARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Truebro by IPS Corporation.
  - 2. Or approved equal.
- B. Underlavatory Guards:
  - 1. Basis-of-Design Product: TrueBro Lav-Shield.
    - a. Description: Durable single piece enclosure conceals piping and valves under the lavatory, preventing direct contact with and burns from piping. Removable to allow service access.
    - b. Material and Finish: Antimicrobial, molded plastic, white.

## 2.08 CUSTODIAL ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. American Specialties, Inc
  - 2. Bobrick Washroom Equipment, Inc
  - 3. Bradley Corporation.
- C. AC-22 - Mop and Broom Holder:
  - 1. Basis-of-Design Product: Bradley Model 9933.
    - a. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
    - b. Length: 34 inches (864 mm).
    - c. Hooks: Four.
    - d. Mop / Broom Holders: Three, spring-loaded, rubber hat, cam type.
    - e. Material and Finish: 18 ga. Stainless steel, No. 4 finish (satin).
    - f. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.

**2.09 FABRICATION**

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

**PART 3 - EXECUTION****3.01 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.
- C. Contractor shall provide blocking at all wall mounted equipment locations, coordinate before installation of gypsum wall board.

**3.02 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION 102800**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. THE ITEMS IN THE SECTION ARE FOR PHASE 1 ONLY
- B. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Surface Mounted, Sensor Operated Towel Dispenser
  - 2. Wall Mounted Soap Dispensers
  - 3. Surface-Mounted Multi-Roll Toilet Tissue Dispensers.
  - 4. ADA Compliant Grab Bars.
  - 5. Mirrors
  - 6. Toilet Seat Cover Dispenser
  - 7. Associated Fasteners
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 042200 – Concrete Unit Masonry for attachment to this material.
  - 2. Section 061000 – Rough Carpentry for wood blocking and nailers.
  - 3. Section 092116 – Gypsum Board Assemblies for attachment to and strapping for this material.
  - 4. Section 093013 – Ceramic Tiling for attachment to this material.
  - 5. Section 102826 – Hygiene Accessories for hand sanitizers and door foot-pulls.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 – Submittal Procedures.
- B. Pursuant to Section 016000 – Product Requirements
- C. Product Data: Provide manufacturer's cut sheets for each different type or style of toilet and miscellaneous accessories required for the project.
- D. Accessories schedule: Indicate manufacturer's name, product description, product model number, finish, mounting, special components, and location of each item.

## 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

- C. Deliver to project site in manufacturer's original packaging with intended location marked on package. Include manufacturer's published installation instructions, fasteners, and installation tools.
- D. Retain finish protective coverings until final cleanup.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Manufacturers for Toilet Accessories: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Bradley Corporation (Basis of Specification – unless noted otherwise)
  - 2. Bobrick Washroom Equipment
  - 3. American Specialties, Inc.
  - 4. AJW Architectural Products
  - 5. Architect Approved Equivalent
- B. Available Manufacturers for Miscellaneous Accessories: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include those listed below or Architect Approved Equivalents to the specified products.

### 2.02 TOILET ROOM ACCESSORIES

- A. Items
  - 1. (AC-3) Surface Mounted sensor activated paper towel dispenser including batteries – Georgia Pacific Pro enMotion® 10"
  - 2. (AC-2) Wall mounted touchless soap dispenser – Bradley 6A00-11 (Battery Operated)
  - 3. (AC-7) Wall- mounted mirror - Bobrick Model B-2908 2436 Series
    - a. Frame: Type 304 stainless steel angle frame, 0.05 inch thick. Mirror shall have a one-piece, type -304 stainless steel angle frame, 3/4" x 3/4" with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror.
    - b. Size: 24" x 36" with mounting height to reflective surface at 40" above finish floor
    - c. Mirror: 1/4" tempered glass mirror with galvanneal steel back
  - 4. Air Freshener: Rubbermaid, model number 1793536. Wall mounted programmable air freshener with adjustable release setting for spray dispensing of liquid air freshener. Aerosol canister refill type (9000 sprays) with LCD display.

### 2.03 TOILET COMPARTMENTS

- A. Items
  - 1. (AC-1) Surface-mounted multi-roll toilet tissue dispenser - Bradley 5402.
  - 2. (AC-8) Surface-mounted toilet seat cover dispenser- Bradley Model 583
  - 3. (AC-4,5,6) Grab Bars – Bradley 812-2 with peened gripping surface – where shown on contract drawings.
    - a. Mounting: concealed with grab bar welded to the mounting flange, mounting flange secured to substrate with stainless steel screws.
    - b. Escutcheon: Cover plate escutcheon is decorative only.
    - c. Surface finish: satin.
    - d. Diameter: 1-1/2 in.; uniform around curves.
    - e. Configurations: as shown on Contract Drawings.

**2.04 FASTENERS – ALL ACCESSORIES**

- A. Provide bolts, screws, plates, anchors, toggles, and other fastening devices for permanent and secure installation to produce loading requirements where applicable and which are designed specifically for adjoining construction.
- B. All fasteners: Stainless steel.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Pursuant to manufacturers published instructions.
- B. Install plumb, level, and square, free of bowing, warping, or racking.
- C. All installations must fasten into solid structure or blocking.
- D. Fit flanges, escutcheons, and edges tight against finish surface.
- E. Provide all accessories keyed alike. Turn over all keys and/or access tools to the Owner.
- F. Remove and discard finish protective coverings.

**END OF SECTION 102813**

## PART – GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes:
  - 1. Touchless Hand Sanitizer Dispenser.
  - 2. Associated Fasteners.
- B. Related Sections:
  - 1. Section 081429 – Prefinished Wood Doors.
  - 2. Section 092116 – Gypsum Board Assemblies for attachment to and strapping for these materials.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.

## 1.04 SUBMITTALS

- A. Submit following pursuant to Section 013300 - Submittal Procedures.
- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Product Data: Indicate manufacturer's name, product model number, mounting, special components, and location of each item.

## 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.
- C. Deliver to project site in manufacturer's original packaging with intended location marked on package. Include manufacturer's published installation instructions, fasteners, and installation tools.
- D. Retain finish protective coverings until final cleanup.

## PART 2 – PRODUCTS

## 2.01 MANUFACTURERS

- A. Manufacturers for Hygiene Accessories: Subject to compliance with requirements, manufacturer's offering products that may be incorporated in the Work include those listed below or Architect Approved Equivalents to the specified products.

**2.02 AC-08 TOUCHLESS HAND SANITIZER DISPENSER - PROVIDED BY OWNER, INSTALLED BY GC**

- A. Manufacturer:
  - 1. Best Sanitizers, Inc., PO Box 1360, Penn Valley, CA 95946, Phone: (888) 225-3267.
  - 2. Architect Approved Equivalent.
- B. Wall mounted touchless dispenser.
  - 1. Versa Clenz All-In-One Hand Hygiene System.
  - 2. ADA Compliant.
  - 3. Single bottle dispenser with multiple product available.
    - a. Foam Soap.
    - b. Hand Cleaner.
    - c. Hand Sanitizer Spray.
    - d. Hand Sanitizer Foam.
    - e. Hand and Body Lotions.
  - 4. Provide each dispenser with two (2) bottles (1000ML) of Apet E3 Plus Hand Sanitizer Spray and one set of batteries.

**2.03 FASTENERS – ALL ACCESSORIES**

- A. Pursuant to manufacturers published instructions.
- B. Install plumb, level, and square, free of bowing, wrapping, or racking.
- C. Install at elevations pursuant to applicable codes, manufacturer's published instructions, and as may be modified on Contract Drawings.
  - 1. Hand Sanitizer Dispenser to be mounted with bottom of unit 44" A.F.F.
- D. Provide hand sanitizer bottles and batteries to the Owner. Do not install in units where they would get utilized by construction personnel.

**END OF SECTION 102826**



## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this section.

## 1.02 SUMMARY

- A. This Section includes Automated External Defibrillators (AED's) cabinets, and signage.
- B. Related Sections include the following:
  - 1. Section 042200 - Concrete Unit Masonry
  - 2. Section 061000 - Rough Carpentry
  - 3. Section 092116 - Gypsum Board Assemblies

## 1.03 STANDARDS AND REFERENCES

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM International (ASTM):
  - 1. ASTM E814-11a, Standard Test Method for Fire Tests of Penetration Firestop Systems.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements
- C. Product Data: For each type of product indicated. Include construction details, materials descriptions, dimensions of individual components and profiles, and finishes for AED cabinets.
  - 1. Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- D. Shop Drawings: For AED cabinets. Include plans, elevations, sections, details, and attachments to other work.
- E. Maintenance Data: For AED cabinets.

## 1.05 QUALITY ASSURANCE

- A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work of this section.

## 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Defibrillator cabinet manufacturers:
  - 1. J. L. Industries, Inc., a division of Activar Construction Products Group, 9702 Newton Ave, S., Bloomington, MN 55431, Phone: 800-554-6077. Basis of Specification.
- B. Architect Approved Equivalent.

## 2.02 AED CABINETS

- A. Cabinet with steel trim and door: 1400 Lifestart™ Series, Model 1417FX2.
  - 1. Cabinet Style: Semi-recessed
  - 2. Location: Final location to be determined in field with owner and architect
  - 3. Components:
    - a. Tub: Cold-rolled steel.
      - 1) Finish: Factory-applied powder coat paint finish.
        - (a) Standard Color: White.
    - b. Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated with roller catch.
      - 1) Finish: Factory-applied powder coat paint finish.
        - (a) Standard Color: White
      - 2) Door Style:
        - (a) Style F17: Full Tempered Glazing; Pull & AED Decal
    - c. Trim Style and Depth:
      - 1) Semi-Recessed Cabinet:
        - (a) Rolled Edge: 3 inch (76.20 mm).
  - 4. Fire-Rating: Provide one hour rated cabinets in rated wall systems.
  - 5. Alarms: Standard: 85 db Commander (audible) cabinet-mounted alarm standard (battery operated) to protect against theft or tampering. Alarm deactivated when door is closed.
  - 6. Wall Signs and Cabinet Lettering:
    - a. AED wall signs: 14TS (Tent Wall Sign)
      - 1) Provide one sign above each cabinet.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed and blocking where surface mounted cabinets will be installed.
  - 1. Notify the Contractor in writing of conditions detrimental to proper and timely completion of the installation.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

- A. Install cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
  - 1. Prepare recesses in walls for defibrillator cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten cabinets to structure, square and plumb, to comply with manufacturer's instructions.
  3. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.
- B. Wall Signs:
1. Location: Where shown or directed.
  2. Apply on walls after field painting is completed and has been accepted.

### 3.03 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as defibrillator cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by cabinet manufacturer.
- E. Replace cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 104313**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes:
  - 1. Fire Extinguisher Cabinets (F.E.C.)
  - 2. Fire Extinguishers

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. NFPA 101 "National Fire Protection Agency Regarding Portable Fire Extinguishers"
- C. Fire extinguishers shall comply with all codes and requirements.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures
- B. Pursuant to Section 016000 - Product Requirements
- C. Product Data: Submit manufacturer's product data and installation instructions including roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, cabinet type and materials, and trim style.
- D. Shop drawings or manufacturer's literature showing size, configuration, capacity, contents and all additional pertinent information describing the equipment to be provided.

## 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workmen familiar with the work and according to manufacturer's recommendations and/or industry standards.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Do not test operate extinguishers.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - 1. Amerex Corporation
  - 2. J. L. Industries, Inc.

3. Larsen's Manufacturing Co.
4. Potter Roemer
5. Kidde
6. Knox Company (Knox Box)

**B. FIRE EXTINGUISHER CABINETS**

1. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim, style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter doorframes.
2. Cabinets in fire rated walls must be fire rated.
3. Cabinet Type: Suitable for mounting conditions indicated, of the following types.
  - a. Semi-recessed the maximum amount limited by the thickness of the wall cavity.
  - b. Inside Dimensions: 9-1/2" wide, 24" high, 6" deep.
  - c. Maximum projection into room, 4" as per ADA.
4. Trim Style: Fabricate trim in one piece with corners mitered, welded and ground smooth.
  - a. Exposed Trim: One-piece combination trim and perimeter doorframe overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
    - 1) Rolled-Edge Trim: Rolled edges backbend as required.
5. Door Material and Construction: Manufacturer's standard door construction of material indicated, coordinated with cabinet type and trim style selected.
  - a. Stainless Steel: Satin finish, hollow steel door construction with tubular stiles and rails.
  - b. Door Glazing: Clear tempered float glass complying with FS DD-G1403, grade B, style I, type I, quality q3, class 1 (transparent).
  - c. Door Style: Manufacturer's standard design as indicated below.
    - 1) Full-Glass Panel: Solid metal door with vertical letters of contrasting color.
  - d. Door Hardware: Provide manufacturer's standard door operating hardware of proper type of cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous type of hinge permitting door to open 180 degrees.

**2.02 FACTORY FINISH**

- A. General: Comply with NAAMM "Metal Finishes Manual" for designations and applications recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering prior to shipment.
- B. Painted Finishes: Provide painted finish to comply with requirements indicated below for extent, preparation and type.
  1. Extent of Painted Finish: Apply painted finish to both concealed and exposed surfaces of cabinet components.
  2. Color: Provide color indicated, or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
  3. Preparation: Clean surfaces of dirt, grease and loose rust or mill scale.
  4. Powder Coated Baked Enamel Finish: Immediately after cleaning and pretreatment, apply cabinet manufacturer's standard baked enameled finish system to the following surfaces:
    - a. Interior of cabinets

**2.03 PORTABLE FIRE EXTINGUISHERS**

- A. Type FEC-1: Multi-purpose dry chemical type. Minimum 5-pound capacity, minimum UL rating 2A:10B:C with hose, nozzle, and color-coded pressure gauge. Amerex Model B500 or equal.
  1. For Fire Extinguisher Cabinets

- B. Type FE-1: Multi-purpose dry chemical type. Minimum 10-pound capacity, UL rating 4A: 80 B: C with hose, nozzle, and color-coded pressure gauge. Amerex Model B456 or equal.
  - 1. Supply mounting bracket for locations in apparatus bay and any other locations as shown on drawings and any other locations required by Codes.
  - 2. Provide rigid plastic 3-Way View Fire Extinguisher sign with arrow and graphic Style No. 84500 by Seton or Architect approved equivalent.
- C. Type FE-2: Wet chemical type. Minimum 6-liter capacity, UL rating 2A:K with spray applicator wand and color-coded pressure gauge. Amerex Model B260 or equal.
  - 1. Supply mounting bracket.
  - 2. Provide in Kitchen 118

### PART 3 EXECUTION

#### 3.01 INSTALLATION:

- A. Install cabinets to comply with manufacturer's instructions in locations to comply with applicable regulations of governing authorities.
  - 1. Prepare recesses in walls for cabinets as required by size of cabinet, style of trim, fire rating to be maintained if required and to comply with manufacturer's instructions.
  - 2. Securely fasten cabinets to structure, square and plumb.
  - 3. Install Fire Extinguisher Cabinets at locations indicated on the drawings. Top of cabinets shall be four feet six inches above finished floor.
- B. Install extinguishers at locations indicated on the drawings.
  - 1. Top of individually mounted extinguishers shall not be more than 54" above finished floor.
  - 2. Bottom shall not be less than 15" above finished floor.

#### 3.02 IDENTIFICATION

- A. Identify existence of fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" applied to door by process indicated below. Provide lettering as selected by Architect from manufacturer's standard arrangements.
  - 1. Application Process: Die Cut.
- B. Provide each wall hung Type FE-1 fire extinguisher with a 3D plastic angle stand out sign mounted above each fire extinguisher. Top of sign to be placed 7'-6" AFF.

#### 3.03 INSPECTION

- A. Verify and ensure that all fire extinguishers are fully charged at the time of installation and that a current fire department inspection tag is prominently attached to each wall unit.
  - 1. Do not test discharge any fire extinguisher. If discharge occurs, recharge unit and secure and affix new inspection tag. Submit copy of new tag to Architect, identifying the affected unit and its installed location. Architect reserves the right to require recharging and inspection of any fire extinguisher which shows evidence of having been operated prior to acceptance.

### END OF SECTION 104400

## PART 1 - GENERAL- PROVIDED BY OWNER, INSTALLED BY GC

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Welded lockers.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Show locker trim and accessories.
  - 3. Include locker identification system and numbering sequence.
- C. Product Schedule: For lockers.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

## 1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

## 1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than two units:
    - a. Locks.
    - b. Identification plates.
    - c. Hooks.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver master and control keys to Owner by registered mail or overnight package service, addressed as follows:

### 1.08 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

### 1.09 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

### 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Faulty operation of latches and other door hardware.
  - 2. Damage from deliberate destruction and vandalism is excluded.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

### 2.02 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.
- B. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

### 2.03 WELDED LOCKERS

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Apex by Debourgh
  - 2. Penco Products, Inc; All-Welded Lockers.
  - 3. Republic Storage Systems Company; All-Welded Ventilated.
  - 4. Or approved equal.
- B. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
  - 1. Tops and Bottoms: 0.060-inch nominal thickness, with single bend at edges.
  - 2. Backs: 0.048-inch nominal thickness.
  - 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- C. Unperforated Sides: Fabricated from 0.060-inch nominal-thickness steel sheet.



- D. Perforated Sides: Fabricated from 0.060-inch nominal-thickness steel sheet with manufacturer's standard diamond perforations.
- E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet or 0.097-inch (2.45-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
  - 1. Cross Frames for Multi-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- F. Reinforced Bottoms: Structural channels formed from 0.075-inch nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.
  - 1. Continuous Hinges: Manufacturer's standard, steel; side or top mounted as required by locker configuration.
- H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
  - 1. Single-Point Latching: Non-moving latch hook with steel padlock loop that projects through recessed cup and is finished to match metal locker body.
    - a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- I. Projecting Turn-Handle and Latch: Steel handle welded to manufacturer's standard, three-point, cremone-type latching mechanism consisting of steel rods or bars that engage locker frame at top and bottom of door, and center latch that engages strike jamb; with steel padlock loop.
- J. Locks: Padlock hasps, for padlocks provided by Owner.
- K. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high block font style (with ADA designation where required), in contrasting color.
- L. Hooks: Manufacturer's standard ball-pointed type, stainless steel .
- M. Recess Trim: Fabricated from 20 gage, 0.0359 inch (0.91 mm) nominal-thickness steel sheet.
- N. Filler Panels: Fabricated from 20 gage, 0.0359 inch (0.91 mm) nominal-thickness steel sheet.
- O. Sloped Top: 20 gage, 0.0359 inch (0.91 mm), with closed ends.
- P. Materials:
  - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
  - 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 (ZF180) zinc-iron, alloy (galvannealed) coating designation.
- Q. Finish: Baked enamel or powder coat.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.04 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
  - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
  - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
  - 1. Single-Tier Units accessible ADA Type: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
  - 2. Triple-Tier Units: One double-prong ceiling hook.
- D. Welded Construction: Factory pre assemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- E. Accessible Lockers: Fabricate as follows:
  - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
  - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
  - 3. Provide hardware that operates with a force of not more than 5 lbf.
- F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
- G. Recess Trim: Fabricated with minimum 2-1/2-inch (64-mm) face width and in lengths as long as practical; finished to match lockers.
- H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- I. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.
- J. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

## 2.05 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
  - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
  - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
  - 2. Anchor single rows of metal lockers to walls near top of lockers and to floor.
  - 3. Anchor back-to-back metal lockers to floor.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
  - 1. Attach hooks with at least two fasteners.
  - 2. Attach door locks on doors using security-type fasteners.
  - 3. Identification Plates: Identify metal lockers with identification as indicated on the Shop Drawings.
    - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
    - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach recess trim to recessed metal lockers with concealed clips.
  - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
  - 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
  - 4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of non-recessed metal lockers.

## 3.03 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

## 3.04 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

### 3.05 LOCKER SCHEDULE

- A. See drawings for Locker sizes
- B. Police Department: Metal lockers, wall mounted with matching closed base.
  - 1. Width: 12 inch and 18 inch as indicated on the drawings
  - 2. Depth: 12 inch and 18 inch as indicated on the drawings
  - 3. Height: 72 inches (1830 mm) and 48 inches (\_\_\_\_ m) at ADA locations
  - 4. Configuration: Single tier
  - 5. Fittings: Size and configuration as indicated on drawings.
    - a. Upper shelf.
    - b. Coat rod.
    - c. Hooks: One double prong.
    - d. Lower shelf/seat.
    - e. Single shoe shelf.
  - 6. Ventilation: Louvers at top and bottom of door panel..
  - 7. Locking: Built-in combination locks.
  - 8. Provide sloped top.

**END OF SECTION 105113**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Fixed wall mounted turnout gear lockers.
  - 2. Mobile turnout gear lockers.
  - 3. Owner will furnish the lockers to the jobsite. General Construction Contractor shall install.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - SUBMITTALS.
- B. Pursuant to Section 016100 - BASIC PRODUCT REQUIREMENTS
- C. Shop Drawings shall be submitted showing individual locker construction and overall dimensions. Complete installation instructions shall be included and provided to the General Construction Contractor.

## 1.05 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workmen familiar with the work and in accordance with the manufacturer's recommendations and/or industry standards.

## 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. All finishes shall be protected from soiling and damage during handling.

## PART 2 PRODUCTS

## 2.01 MANUFACTURER

- A. Provide turnout gear lockers and firematic equipment listed below as manufactured by Mid-Minnesota Wire (GearGrid Product Line), 670 S.W. 15th St., Forest Lake, MN. 55025. Phone 888-643-6694.

## 2.02 GEAR LOCKERS

- A. Wall Mounted
  - 1. Size: 24" wide x 20" deep x 74 ½" high with secure door.
  - 2. Quantity: 40 - configurations as shown on drawings.

- B. Mobile
  - 1. Size: 24" wide x 20" deep x 83 1/2" high with secure door.
  - 2. Quantity: 26 lockers-configurations as shown on drawings.
- C. Color: As selected by Architect from manufacturer's standard & special-order colors.
- D. Accessories:
  - 1. Provide one (1) Geardryer™ coat drying hanger per locker.
  - 2. Provide one (1) Gearglove™ glove drying hanger per locker.
  - 3. Provide GearGrid topside storage rack on all wall mounted lockers.
  - 4. Provide one (1) Gearhanger™ horizontal hanging rod per locker.
  - 5. Provide three (3) apparel hooks per locker.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Assemble and install gear lockers at locations directed by owner in accordance with manufacturer's instructions for plumb, level, and square, free of bowing, warping or racking.
- B. All wall mounted lockers must fasten with stainless steel hardware into solid structure or blocking.
- C. Anchor the units with stainless steel fasteners in accordance with the manufacturer's printed instructions.
- D. Do not install until all painting and epoxy flooring (if any) is completed.

#### 3.02 TOUCH UP

- A. Touch up marred finishes; replace units that cannot be restored to factory-finished appearance. Use only materials furnished and procedures recommended by the locker manufacturer.

### END OF SECTION 105113.13

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Building supported, pre-engineered metal canopies including fascia channels, decking, tension rods, downspouts and attachment hardware.
- B. Related Sections:
  - 1. Section 076200 - Sheet Metal Flashing and Trim.
  - 2. Section 079200 – Sealants.

## 1.03 REFERENCES

- A. Aluminum Association (AA) DAF 45 – Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association (AAMA)
  - 1. AAMA 2605 - "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels".
- C. American Society of Civil Engineers (ASCE) 7 – Minimum Design Loads for Buildings and Other Structures.
- D. ASTM B221– "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes".
- E. ASTM B429 - "Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube".

## 1.04 SYSTEM DESCRIPTION

- A. Design Requirements:
  - 1. Design canopy system to withstand: wind pressure, snow load, and drifting snow load in accordance with current adopted requirements of the International Building Code or accepted requirements of local authorities having jurisdiction.

## 1.05 SUBMITTALS

- A. Pursuant to Section 013300 – Submittal Procedures.
- B. Pursuant to Section 016000 – Product Requirements.
- C. Manufacturer's Qualifications: Company specializing in the engineering and manufacture of preassembled canopies with a minimum of fifteen (15) years experience in canopy design and fabrication.
- D. Product Data:
  - 1. Manufacturer's catalogue cuts.
- E. Shop Drawings: Indicate system components, dimensions, attachments, and accessories.
  - 1. Professional Engineering calculations are required and must be signed and sealed by an Engineer licensed in the State canopy is to be installed.

- F. Color Samples for Initial Selection Purposes: Submit manufacturer's color samples of materials, consisting of complete color charts (3 copies) representing manufacturer's full range of available colors in the specified finish.
- G. Verification Samples:
  - 1. 3 x 3 inch coating samples in specified color and finish.
  - 2. 6 inch long fascia extrusion sample showing profile and standard finish.
  - 3. 6 inch decking samples showing profile and standard finish.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 years experience in installation of pre-engineered canopy systems.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store all canopy components in protected areas.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. MASA Architectural Canopies. 250 Stelton Road, Piscataway, NJ 08854, Phone: (800) 761-7446. Web site: [www.architecturalcanopies.com](http://www.architecturalcanopies.com). (Basis of Design)
  - 1. Extrudeck
- B. FenWall Fabrication & Manufacturing, 13929 Lynmar Boulevard, Tampa, FL 33626, Phone: (813) 343-5979.
- C. Vestis Systems, 213 East Ermina Avenue, Spokane, WA 99207. Phone: (509) 213-1342.

#### 2.02 MATERIALS

- A. Aluminum Extrusions:
  - 1. ASTM B221 & ASTM B429/B429M 6063-T5 alloy and temper.
- B. Hardware:
  - 1. All fasteners shall be stainless steel for corrosion resistance.

#### 2.03 COMPONENTS

- A. Curved Side Canopy
  - 1. Framing: Type: Extruded aluminum "J" channel fascia.
    - a. Size: 8"
  - 2. Canopy Supports: Extruded Aluminum Canopy Support "I" Beam.
  - 3. Decking: 3" x 6" x .090" Interlocking Extruded aluminum standing seam soffit decking.
  - 4. Attachment: 1.050" diameter steel hanger rod with square wall plates, finished to match canopy.
  - 5. Custom Fascia Profiles: Square
  - 6. Other Components: Other components as indicated or as required for system attachment and performance.
- B. Curved Main Canopy
  - 1. Framing: Type: Extruded aluminum "J" channel fascia.
    - a. Size: 8"



2. Canopy Supports: Extruded Aluminum Canopy Support "I" Beam.
3. Decking: 3" x 6" x .090" Interlocking Extruded aluminum standing seam soffit decking.
4. Attachment: Post/Beam Mounted. Refer to drawings
5. Custom Fascia Profiles: Square
6. Other Components: Other components as indicated or as required for system attachment and performance.

#### 2.04 ACCESSORIES

- A. Down Spouts 2" x 3", 0.125 Heavy Extruded Finished to match canopy color and finish.
  1. Extend downspouts to precast concrete splash blocks at grade.
  2. Secure downspouts to building with matching brackets located at a maximum 5' - 0" o.c. with no less than two (2) brackets per downspout..

#### 2.05 FABRICATION

- A. Fabricate canopy system in accordance with approved Shop Drawings.
  1. Pre-assembled canopies are shop welded by MASA approved personnel.
  2. Drainage system to be concealed type. Covered surfaces direct water to field drilled drain, to be coordinated at site.

#### 2.06 FINISHES

- A. AAMA 2605 Fluoropolymer coating containing a minimum 70% PVDF Resins.
- B. Duranar by PPG Industries, Inc.
- C. Color: As selected by Architect from manufacturer's full color range.

### PART 3 EXECUTION

#### 3.01 FIELD DIMENSIONS

- A. Field verify dimensions of supporting structure at site of installation prior to fabrication.

#### 3.02 INSTALLATION

- A. Install in strict accordance with manufacturer's instructions and approved Shop Drawings.
- B. Protect the finish during handling and erection.
- C. Install components plumb and level, in proper plane, free from warp and twist.
- D. Anchor canopy system to building components; provide adequate clearance for movement caused by thermal expansion and contraction and wind loads.
- E. Provide compression spacers between canopy and veneer masonry.
- F. Surround wall anchors with watertight sealant.
- G. Embed all wall anchors washers in sealant to provide watertight seal.
- H. To ensure proper drainage, install canopy with positive camber.
- I. Seal all corners, edge seams, etc. Rain water must flow to gutter and downspout(s). Water shall not drip-thru canopy in any location.

3.03 ADJUSTING

- A. Touch up minor scratches and abrasions on finished surfaces to match original finish.
- B. Clean with mild, non-abrasive solution and a cotton cloth under low pressure.

**END OF SECTION 107316.13**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes ground-set, fixed, cone tapered flagpole(s) and associated foundation.

## 1.03 RELATED SECTIONS:

- A. Section 033000 - CAST-IN PLACE CONCRETE

## 1.04 STANDARDS

- A. All work of this Section shall conform to industry standards and/or manufacturer's recommendations.
- B. Manufacturing Standards: Provide flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.
- C. Design Criteria: Provide flagpole and installation constructed to withstand a 90-mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.
- D. Pole Construction: Construct pole and ship to site in one piece if possible.

## 1.05 SUBMITTALS

- A. Pursuant to Section 013300 - Submittals.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Shop drawings of flagpole and base, showing general layout, jointing, grounding method, and anchoring and supporting systems.
  - 1. Include details of foundation system for ground-set poles.
  - 2. Provide product cut sheets and wiring diagrams for pole mounted LED down light fixture.

## 1.06 QUALITY ASSURANCE

- A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards.

## 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. General: Spiral wrap flagpole with heavy Kraft paper or the weather-tight wrapping and prepare for shipment in hard fiber tube or another protective container.
- D. Deliver flagpole and accessories completely identified for installation procedure. Handle and store flagpole to prevent damage or soiling.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURER:

- A. American Flagpole Division of Kearney-National, Inc.
- B. Baartol Co., Inc.
- C. Concord Industries, Inc.
- D. Eagle Mountain Flag and Flagpole (Basis of Design).
- E. John Ewing and Co., Inc.
- F. Pole-Tech Co., Inc.
- G. Architect Approved Equivalent

## 2.02 FLAGPOLE CONSTRUCTION

- A. Aluminum Flagpoles: Fabricate from seamless extruded tubing complying with ASTM B241/B241M, alloy 6063-T6, having a minimum wall thickness of 3/16 inch (0.1875 inch), 6 inch butt diameter, Tensile strength not less than 30,000 psi, and a yield point of 25,000 psi. Provide with factory installed handhole located 36" above grade. Heat-treat and age-harden after fabrication.
  - 1. Provide cone-tapered aluminum flagpole.
  - 2. One (1) required at 30'-0" from grade.
  - 3. Two (2) required at 25'-0" from grade
- B. FLAGPOLE TYPE - NAUTICAL
  - 1. Model ECP30-Y (30'), satin finish with 8'-6" yardarm as manufactured by Excel Sails Flags and Flagpoles, 32968 Stonecroft Drive, Gravois, MO 65037.

## 2.03 FLAGPOLE MOUNTING

- A. Provide manufacturer's standard base system for the type of flagpole installation required.
- B. Foundation Tube: For ground-set flagpole, provide 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightening ground spike, and centering wedges, all welded construction. Provide loose hardwood wedges at tope for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.
  - 1. Provide manufacturer's standard flash collar, finished to match flagpole.
  - 2. Provide 1" conduit with long sweep (90 degree) from 36" above top of foundation to 6" outside foundation below lowest point of pole. Conduit to be centered within flagpole.

## 2.04 SHAFT FINISH

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Aluminum: Finish designations prefixed by "AA" conform to the Aluminum Association system for designating aluminum finishes. Provide fine, directional, medium satin polish (AA-M32), Finished as follows:

1. Medium Matte Mechanical Satin Finish Natural Clear Anodized finish complying with AA-M32A41 (Mechanical Satin Finish - Clear Anodized), Class I (0.7 mil).

## 2.05 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, size as indicated or, if not indicated, to match pole butt diameter.
  1. 14-gage aluminum gold anodized.
- B. Truck: Ball bearing, non-fouling, revolving, double-truck assembly of cast metal finished to match pole shaft.
- C. Yardarm: Aluminum with pulleys and mounting bracket.
- D. Cleats: Two 9-inch cast metal cleats with fasteners, finished to match pole shaft. Three for Nautical Poles.
- E. Halyards: Provide two continuous halyards for flagpole as follows:
  1. Nylon, braided.
  2. Size: 3/8 inch (No. 12)
- F. Halyard Flag Snaps: Provide two swivel snaps per halyard, as follows:
  1. Brass

## PART 3 - EXECUTION

### 3.01 PREPARATION FOR GROUND-SET POLES

- A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions.
  1. 3,500 psi Compressive Strength after 28 days.
- B. Finish: Trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base perimeter.

### 3.02 FLAGPOLE INSTALLATION

- A. General: Prepare and install flagpoles where shown and in compliance with accepted shop drawings and manufacturer's instructions.
  1. Provide positive lighting ground for each flagpole installation.
  2. Paint below-grade portions of ground-set flagpole with heavy coat of bituminous paint.
  3. Coordinate with Electrical Contractor for wiring of driver/transformer.

**END OF SECTION 107516**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes commercial Gear Washer/Extractor.
- B. Equipment to be furnished by owner, installed by contractor.
- C. Related Sections include the following:
  - 1. Division 22 for plumbing connections to appliances.
  - 2. Division 26 for electrical services and connections to appliances.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. UL Certification: Provide electric equipment and components that are evaluated by UL for fire, and electric shock according to applicable safety standards and that are UL certified for compliance and labeled for intended use.

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016100 - Product Requirements.
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
- D. Shop Drawings: Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.
- E. Coordination Drawings: Indicate locations of laundry equipment and connections to utilities, and clearance requirements for equipment access and maintenance.

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the appliance manufacturer for both installation and maintenance of appliances required for this Project.
- B. Product Options: Drawings and specifications indicate sizes, profiles, and dimensional requirements of appliances and are based on the specific types and models indicated. Other manufacturers' appliances with equal performance characteristics may be considered. Refer to Division 01 Section "Product Requirements".
- C. Electrical Appliances: Listed and Labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

- D. UL and NEMA Compliance: Provide electrical components required as part of appliances that are listed and labeled by UL and that comply with applicable NEMA Standards.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment on site protected from weather, direct sunlight and temperature extremes. Do not remove packaging prior to storage.
- B. Consult manufacturer if machines are to be stored for an extended period of time.

#### 1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Wascomat
- B. Requests for substitutions will be considered in accordance with provisions of Division 01 in the Project Manual.

#### 2.02 MATERIALS

- A. Washer Extractors - Stainless Steel: ASTM A 666, Type 304 with No. 4 finish (directional stain finish) on exposed surfaces.

#### 2.03 WASHER EXTRACTOR MODELS AND COMPONENTS LR-01

- A. Model No. EXSM230C.
  - 1. Design: Freestanding automatic laundry washer-extractor for processing water-washed linen items.
    - a. Construction: 304 equal stainless steel cylinder, tub, front and top panels.
    - b. Input Voltage: Z: 208-240V 1-Phase 60Hz 15 A
    - c. Dry weight capacity: 65 lb.
    - d. Wash cylinder volume: 8.5 cu. ft. minimum.
    - e. Overall width: 36 13/16 inches nominal.
    - f. Overall height: 56 5/16 inches nominal.
    - g. Overall depth: 34.25 inches nominal/
    - h. Number and size of water supply inlet valves: 3 with 3/4 inch BSP male connections (2 standard, 1 optional).
    - i. Number and size of drain outlets: 1 at 3 inches.
    - j. Overflow: internally plumbed.
    - k. Control system: Programmable microprocessor.
    - l. Cylinder drive: Single motor, 4 hp, capable of 980 RPM maximum, using a rotation sensor to monitor performance.
    - m. Bearing lubrication: Shall require lubrication once a month or every 200 working hours whichever comes first.
  - 2. Performance:
    - a. G-force at highest extract speed: 220 G's.
    - b. Chemical Supply System:
      - 1) Manually filled 5 compartment dry chemical dispensing system.

- 2) Automatic flushing and connections for 11 external supply lines and control sights for 8 external supplies.
- c. Control System:
  - 1) Programmable microprocessor.
  - 2) Thermal cooldown.
  - 3) Overnight soak.
- d. Drain valve automatically open in event of power failure.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. System Startup and Commissioning: Arrange for local manufacturer's representative to inspect machines prior to startup and operation.

#### 3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

### END OF SECTION 112173.26



## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Project Manual, apply to this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Gas Stove
  - 2. Refrigerator
- B. Equipment to be furnished by owner, installed by contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 22 for plumbing connections to appliances.
  - 2. Division 26 for electrical services and connections to appliances.

## 1.03 SUBMITTALS

- A. Product Data: For each appliance type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.

## 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the appliance manufacturer for both installation and maintenance of appliances required for this Project.
- B. Product Options: Drawings and specifications indicate sizes, profiles, and dimensional requirements of appliances and are based on the specific types, models and manufacturers indicated. Other manufacturers' appliances with equal performance characteristics meeting all size requirements may be considered. Refer to Division 01 Section "Product Requirements".
- C. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- D. UL and NEMA Compliance: Provide electrical components required as part of appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
- E. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.
- F. AHAM Standards: Provide appliances that comply with the following AHAM standards:
  - 1. Refrigerators and Freezers: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.
    - a. Energy Ratings: Provide appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

## 1.05 DELIVERY

- A. Deliver appliances only after utility rough in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

## 1.06 WARRANTIES

- A. Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace appliances or components that fail in materials or workmanship within specified warranty period.

## PART 2 PRODUCTS

## 2.01 CK-01 GAS RANGE

- A. Manufacturer: GE Appliances, a Haier company, Rapid City, SD 57709
- B. Model: JGBS30REKSS, 30" 4-Burner Gas Range
- C. 4.8 CU oven.
- D. 6" Adjustable legs
- E. Electronic pilot ignition system for open tops

## 2.02 CK-02 REFRIGERATOR

- A. Manufacturer: KitchenAid, 553 Benson Road, Benton Harbor, MI 49022
- B. Model: [KRFC300ESS, 30" 4-Burner Gas Range
- C. Total Capacity: 20 cu ft
  - 1. Refrigerator Capacity: 14 cu ft
  - 2. Freezer Capacity: 6 cu ft
- D. Energy Star Certified
- E. Type: French Door
- F. Ice maker, interior water dispenser

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before appliance installation.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

- A. General: Comply with manufacturer's written instructions.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

**3.03 ADJUSTING AND CLEANING**

- A. Test each item of appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material from appliances and leave units in clean condition, ready for operation.

**END OF SECTION 113013.13**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions and Division 01 Project Manual, apply to work of this this Section.

## 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Washing Machine
  - 2. Electric Clothes Dryer
- B. Equipment to be furnished by owner, installed by contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 22 for plumbing connections to appliances.
  - 2. Division 26 for electrical services and connections to appliances.

## 1.03 SUBMITTALS

- A. Pursuant to Section 013300 – Submittal Procedures.
- B. Pursuant to Section 016000 – Product Requirements.
- C. Product Data:
  - 1. For each appliance type required indicating compliance with requirements.  
Include:
    - a. Rough-in drawings.
    - b. Operating and Maintenance instructions.
    - c. Sample Warranty.
  - 2. Product cut sheet on wall mounted shelf with integral clothes hanging bar.

## 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the appliance manufacturer for both installation and maintenance of appliances required for this Project.
- B. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of appliances and are based on the specific types and models indicated. Other manufacturers' appliances with equal performance characteristics may be considered.  
Refer to Division 01 Section "Product Requirements".
- C. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- D. UL and NEMA Compliance: Provide electrical components required as part of appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
- E. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.
- F. Energy Ratings: Provide appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

### 1.05 DELIVERY

- A. Deliver appliances only after utility rough in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

### 1.06 WARRANTIES

- A. Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace appliances or components that fail in materials or workmanship within specified warranty period.

## PART 2 PRODUCTS

### 2.01 TOP LOAD WASHER LR-02

- A. Manufacturer: GE Appliances, a Haier company, Rapid City, SD 57709
- B. Model: Existing- GTWN4250DOWS
- C. Color: White

### 2.02 FRONT LOAD DRYER LR-03

- A. Manufacturer: GE or Architect Approved Equivalent.
- B. Model: GTD84GCSN/GCPN
- C. Color: Per Owner
- D. Energy Star® Certified.
- E. ADA Compliant (Lower unit).

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before appliance installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Comply with manufacturer's written instructions.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

### 3.03 ADJUSTING AND CLEANING

- A. Test each item of appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.

- C. Remove packing material from appliances and leave units in clean condition, ready for operation.

**END OF SECTION 113033.23**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Fabricated equipment.
  - 2. Cooking equipment.
  - 3. Self-contained refrigeration equipment.
- B. Owner-Furnished Equipment: Where indicated, Owner will furnish equipment for installation by Contractor.

## 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Manufacturer's model number.
  - 2. Accessories and components that will be included for Project.
  - 3. Clearance requirements for access and maintenance.
  - 4. Utility service connections for water, drainage, power, and fuel; include roughing-in dimensions.
- B. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Warranty: Samples of special warranty.

## 1.05 QUALITY ASSURANCE

- A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF standards.
- B. UL Certification: Provide electric and fuel-burning equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use.
- C. Steam Equipment: Provide steam-generating and direct-steam heating equipment that is fabricated and labeled to comply with ASME Boiler and Pressure Vessel Code.

## 1.06 REGULATORY REQUIREMENTS:

- A. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.
- B. ASHRAE Std 15, "Safety Code for Mechanical Refrigeration."
- C. NFPA 54, "National Fuel Gas Code."
- D. NFPA 70, "National Electrical Code."

- E. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."

#### 1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate measurements on Coordination Drawings.

#### 1.08 COORDINATION

- A. Coordinate foodservice equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.
- B. Coordinate locations and requirements of utility service connections.
- C. Coordinate sizes, locations, and requirements of the following:
1. Overhead equipment supports.
  2. Equipment bases.
  3. Floor depressions.
  4. Insulated floors.
  5. Floor areas with positive slopes to drains.
  6. Floor sinks and drains serving foodservice equipment.
  7. Roof curbs, equipment supports, and penetrations.

#### 1.09 WARRANTY

- A. Refrigeration Compressor Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace compressors that fail in materials or workmanship within specified warranty period.
1. Failure includes, but is not limited to, inability to maintain set temperature.
  2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.01 FABRICATED EQUIPMENT

- A. Equipment to be supplied by owner and installed by Contractor.
- B. Stainless-Steel Two Compartment Sink with Drainboards: K-04\_\_\_\_\_. (TO BE SUPPLIED BY OWNER)
1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Advance Tabco FC-2-2424-18RL.
    - b. Or approved equal.
  2. Description: Two -compartment sink. Fabricate units of welded stainless steel, sound deadened.
    - a. Bowls: Stainless steel, Type 304, 16 ga
    - b. Integral Drainboards: Stainless steel, Type 304, 0.078 inch (1.98 mm) thick.
    - c. Body: Stainless steel, Type 304, 16 ga.
      - 1) Back Splash: 8.5"
    - d. Legs and Feet: Stainless steel tubing legs with adjustable feet.
    - e. Faucet Holes: Provided, coordinate with plumbing fixtures.
- C. Splash Mount Prerinse Faucet: K-05 (TO BE SUPPLIED BY OWNER)
1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Advance Tabco: DTA-53



- b. Or approved equal.
  - 2. Description:
    - a. Materials: Brass chrome plated body, chrome plated handles
    - b. 8" O.C. water supply
    - c. Quarter-turn wedge style handles
    - d. Spray head with continuous water ring
    - e. Heavy duty hose spring
    - f. wall mount bracket
    - g. Adjustable spray head hook
    - h. Flow Rate: 1.6 GPM @ 60 PSI
- D. 8" Swing Spout Splash Mount Faucet: [K-06] (TO BE SUPPLIED BY OWNER)
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Advance Tabco: K-101
    - b. Or approved equal.
  - 2. Description:
    - a. Materials: Brass chrome plated body and spout, chrome plated handles
    - b. 8" O.C. water supply.
    - c. Quarter-turn wedge style handles
    - d. Colored hot & cold Indexes.
    - e. 1.5 GPM/5.7 LPM Aerator. 60 PSI
- E. Stainless-Steel Two-compartment Sink with DrainboardS: SC-01 (TO BE SUPPLIED BY OWNER)
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Advance Tabco: 93-22-40-24RL.
    - b. or approved equal.
  - 2. Description: Two -compartment sink. Fabricate units of welded stainless steel, sound deadened.
    - a. Bowls: Stainless steel, Type 304, 16 ga
    - b. Integral Drainboards: Stainless steel, Type 304, 0.078 inch (1.98 mm) thick.
    - c. Backsplash: 9 inches tall with 2 inch wide return.
    - d. Legs and Feet: Stainless steel tubing legs with adjustable feet.
    - e. Faucet Holes: Provided, coordinate with plumbing fixtures.
- F. Stainless-Steel Table:K-08 \_\_\_\_\_ (TO BE SUPPLIED BY OWNER)
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Advance Tabco KMS-240.
    - b. or approved equal.
  - 2. Description: Flat-countertop table.
    - a. Tops: Stainless steel, Type 304, 0.078 inch (1.98 mm) thick, reinforced and sound deadened.
      - 1) Edge: Bullnose on front edge and splash on back , straight on sides.
    - b. Adjustable Undershelf: Stainless steel, Type 304, 0.050 inch (1.27 mm) thick.
    - c. Legs: Stainless-steel tubing.
    - d. Backsplash: 5" with 1" return on rear side
  - 3. Materials:
    - a. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
  - 4. Stainless-Steel Finish: Directional satin finish, No. 4.
- G. Stainless-Steel Wall Shelf: K-09 (TO BE SUPPLIED BY OWNER)
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Eagle SWS1548.
    - b. Or approved equal.

2. Description: Snap-n-Slide Wall Shelf with Rolled Front Edge
  - a. Materials: 14 gauge, 304 stainless steel with satin finish.
  - b. Front rolled edge with 1 1/2" upturn on rear and ends
  - c. Dimensions: 48inches long by 15 inches wide, with 10-1/2 inch deep welded shelf brackets.
- H. Microwave Shelves: K-07 (TO BE SUPPLIED BY OWNER)
  1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Advance Tabco: MS-20-30.
    - b. Or approved equal.
  2. Description: Wall mounted.
    - a. Materials: 18 ga. stainless steel, Exposed surfaces polished to a satin finish
    - b. Dimensions: 20 inches wide by 30 inches long
    - c. All TIG welded

## 2.02 COOKING EQUIPMENT

- A. Ranges: K-01 (TO BE SUPPLIED BY OWNER)
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Garland Model G60-6G24CC1.
    - b. or approved equal.
  2. Description:
    - a. Top Configuration:
      - 1) Open-Burner Unit:
        - (a) Standard Burners: Six burners and griddle
        - (b) Cast iron top and stainless steel griddle cover.
        - (c) Stainless Steel Front and Sides
        - (d) Stainless Steel 5" Plate rail
        - (e) Stainless steel backguard with removable shelf
    - b. Base Configuration:
      - 1) Double Convection Ovens
    - c. Accessories:
      - 1) 6" Leveling swivel casters with front locking
    - d. Gas Service: Natural gas.
- B. Microwave Oven: K-14 (TO BE SUPPLIED BY OWNER)
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Panasonic NE-1054F.
    - b. or approved equal.
  2. Description: Commercial Microwave Oven.
    - a. Output: 1000 watts.
    - b. Materials: Stainless steel exterior, transparent door and lit interior.
    - c. Capacity: 0.8 cu. ft.
    - d. Operation: Programmable operation with digital display and four cooking stages.
  3. Accessories:
    - a. Adapter to convert unit to hold three 4-quart inserts.
  4. Power: 120v, 60 Hz, 13.4 amps, single phase, NEMA 5-15R or NEMA 5-20R

## 2.03 SELF-CONTAINED REFRIGERATION EQUIPMENT

- A. Refrigerators: K-02 (TO BE SUPPLIED BY OWNER)
  1. Products: Subject to compliance with requirements, provide the following:
    - a. True Food Service Equipment - T-49-HC
    - b. or approved equal
  2. Description: Reach-in type.

- a. Exterior Finish: Stainless steel.
  - b. Interior Finish: Stainless steel.
  - c. Doors: Full length.
  - d. Accessories:
    - 1) 4" swivel Casters.
    - 2) Stainless steel front, sides, aluminum interior with stainless steel floor.
    - 3) Re-hinging feature for doors.
    - 4) Top mount self-contained compressor, 1/3 HP, 115v/60/1, 5.4 amps, NEMA 5-15P, NSF-7, ETL, ENERGY STAR.
    - 5) (3) PE coated wire shelves per section, chrome-plated shelf clips.
  - e. Electrical Service: Equip unit with plug and cord for service indicated on Drawings.
- B. Freezers: K-03 (TO BE SUPPLIED BY OWNER)
- 1. Products: Subject to compliance with requirements, provide the following:
    - a. True Food Service Equipment - T-23F-HC
    - b. or approved equal.
  - 2. Description: Reach-in type.
    - a. Exterior Finish: Stainless steel.
    - b. Interior Finish: Stainless steel.
    - c. Doors: Full length.
    - d. Accessories:
      - 1) 4" swivel Casters.
      - 2) Stainless steel front, sides, aluminum interior with stainless steel floor.
      - 3) Re-hinging feature for doors.
      - 4) Top mount self-contained compressor, 1/3 HP, 115v/60/1, 3.7 amps, NEMA 5-15P, NSF-7, ETL, ENERGY STAR.
      - 5) (3) PE coated wire shelves per section, chrome-plated shelf clips.
    - e. Electrical Service: Equip unit with plug and cord for service indicated on Drawings.
- C. Ice-Making Machine: K-10 (TO BE SUPPLIED BY OWNER)
- 1. Products: Subject to compliance with requirements, provide the following:
    - a. Manitowoc: iT0620
    - b. or approved equal
  - 2. Description: Freestanding unit.
    - a. Production: dice sized ice cubes.
    - b. Capacity: 525 lb (kg). per 24-hour period.
    - c. Air cooled.
    - d. Self-contained condenser.
    - e. 115v/60/1, 1.6 amps, 6' cord with NEMA 5-15P
    - f. Accessories:
      - 1) Storage Bin: D-400 with K00443
        - (a) Storage Capacity: 365 lb (kg), 6" adjustable legs
      - 2) 3-year parts & labor Commercial warranty.

#### 2.04 MISCELLANEOUS MATERIALS

- A. Installation Accessories, General: NSF certified for end-use application indicated.
- B. Elastomeric Joint Sealant: ASTM C 920; silicone. Type S (single component), Grade NS (non-sag), Class 25, Use NT (non-traffic) related to exposure, and Use M, G, A, or O as applicable to joint substrates indicated.
  - 1. Public Health and Safety Requirements:
    - a. Sealant is certified for compliance with NSF standards for end-use application indicated.

- b. Washed and cured sealant complies with the FDA regulations for use in areas that come in contact with food.
- 2. Cylindrical Sealant Backing: ASTM C1330, Type C, closed-cell polyethylene, in diameter greater than joint width.

## 2.05 FINISHES

- A. Stainless-Steel Finishes:
  - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
  - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
    - a. Run grain of directional finishes with long dimension of each piece.
    - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Powder-Coat Finishes: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install food service equipment level and plumb, according to manufacturer's written instructions.
  - 1. Connect equipment to utilities.
  - 2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.
- B. Complete equipment assembly where field assembly is required.
  - 1. Provide closed butt and contact joints that do not require a filler.
  - 2. Grind field welds on stainless-steel equipment until smooth and polish to match adjacent finish.
- C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.
- D. Install cabinets and similar equipment on bases in a bed of sealant.
- E. Install closure-trim strips and similar items requiring fasteners in a bed of sealant.
- F. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

### 3.02 CLEANING AND PROTECTING

- A. After completing installation of equipment, repair damaged finishes.
- B. Clean and adjust equipment as required to produce ready-for-use condition.
- C. Protect equipment from damage during remainder of the construction period.

### 3.03 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain food service equipment.

**END OF SECTION 114000.13**

## PART 1 GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

## 1.02 SUMMARY

- A. This Section includes, but is not limited to, the following:
  - 1. Lavatory countertops, backsplashes, side splashes and aprons.
  - 2. Kitchen countertops, backsplashes and side splashes.
  - 3. Meeting Room 116 countertop and backspalshes
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 061000 - Rough Carpentry
  - 2. Section 064100 – Architectural Wood Casework
  - 3. Section 079200 - Sealants
  - 4. Section 092900 – Gypsum Board
  - 5. Section 093013 - Ceramic Tiling
  - 6. Division 22: Plumbing - furnishing, installation, and hook-up of sinks, fixtures, outlets, strainers, tailpieces, traps, vacuum breakers, stops, etc., shall be performed by the Plumbing Contractor in accordance with Federal, State and local building codes.

## 1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ANSI/NSF 51 -"Food Equipment Materials"
- C. ASTM C170 – "Standard Test Method for Compressive Strength of Dimension Stone".
- D. ASTM E84 – "Standard Test Method for Surface Burning Characteristics of Building Materials".

## 1.04 SUBMITTALS

- A. Pursuant to Section 013300 - Submittal Procedures.
- B. Pursuant to Section 016000 - Product Requirements.
- C. Sustainable Design Reporting:
  - 1. Provide documentation from manufacturer of the amounts of pre-consumer and/or post-consumer recycled content for products.
  - 2. Provide documentation from manufacturer showing manufacturing locations for products manufactured and sourced within 500 miles of project site.
  - 3. Provide documentation from manufacturer that products meet or exceed emissions guidelines for volatile organic compounds (VOCs).
  - 4. Provide documentation from manufacturer indicating that adhesives and sealants applied on project site meet or exceed emissions guidelines for volatile organic compounds (VOCs) and comply with SCAQMD Rule #1168.
- D. Manufacturer certifications:
  - 1. Signed by manufacturers certifying that they comply with the following requirements:
    - a. NSF/ANSI Standard 51: Food Contact
    - b. UL 723 (ASTM E84): Surface Burning Characteristics

- E. Product Data:
  - 1. Submit manufacturer's technical product data on material characteristics, performance properties, fabrication instructions and installation instructions.
- F. Shop Drawings:
  - 1. Show location of each item; provide complete detailed and dimensioned plans and elevations, large-scale details, attachment devices and other components.
    - a. Show the following:
      - 1) Full-size details, edge details, attachments, backsplashes, side splashes, aprons, etc.
      - 2) Locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      - 3) Fabrication details for brackets.
      - 4) Details of anchorage to cabinets and to walls.
      - 5) Locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in quartz surface.
      - 6) Locations and sizes of cutouts for sink installation and lavatory installation.
      - 7) Type of sealant.
      - 8) Type of adhesive.
      - 9) Seam locations.
      - 10) Show direction of directional pattern, if any.
- G. Samples:
  - 1. 2" x 2" sample for each of Manufacturer's full line of colors, pattern, and finishes for initial selection.
  - 2. Two (2) 6" x 6" samples of each color selected.
  - 3. 4" long samples of each style of Custom Edging.
- H. Maintenance Data:
  - 1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
  - 2. Include in project closeout documents.

#### 1.05 QUALITY ASSURANCE

- A. Provide Certified Statement by technical representative of the solid surfacing manufacturer that the fabricator and installer are certified or approved.
- B. Applicable Standards:
  - 1. Standards of the following, as referenced herein:
    - a. American National Standards Institute (ANSI)
    - b. American Society for Testing and Materials (ASTM)
    - c. NSF International
  - 2. Fire test response characteristics:
    - a. Provide with the following Class A (Class 1) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
      - 1) Flame Spread Index: 25 or less
      - 2) Smoke Developed Index: 450 or less
- C. Verify all dimensions in field.
- D. Allowable Tolerances:
  - 1. +/- 1/8" in component size over a 10 foot length.

2. +/- 1/8" in location of openings from indicated location.
3. Minimum of 1/16 inch and a maximum of 1/8 inch clearance between quartz surfaces and each wall.

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect countertops during transit, delivery, storage and handling to prevent moisture exposure, damage, soiling and deterioration.
- C. Store components indoors in clean and dry area prior to installation.
- D. Do not deliver until painting, wet work, grinding and similar operations, which could be performed before installation of casework, have been completed in installation areas.

#### 1.07 WARRANTY

- A. Provide manufacturer's 10-year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Warranty shall begin at date of substantial completion.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers:
  1. Silestone by Cosentino SA, Apdo No. 1 Macael 04867, Almeria, Spain. (Basis of Physical Characteristics)
  2. Cambria USA, 11000 West 78th Street, Suite 220, Eden Prairie, MN 55344 Phone: 866-226-2742.
  3. Corian® Design, Corian® Quartz (formerly known as Zodiac®), Chestnut Run Plaza, 974 Centre Road, P.O. Box 2915, Wilmington, DE 19805, Phone: 800-426-7426.
  4. Architect approved equivalent.

#### 2.02 COUNTERTOP MATERIALS

- A. Engineered Stone Countertops
  1. Composition: Quartz aggregate, resin, and color pigments formed into flat slabs.
  2. Physical Characteristics:
    - a. Water absorption: Maximum 0.04 percent, tested per ASTM C 97
    - b. Bond strength: Average of 211 PSI (1.4 MPa), tested per ASTM C482
    - c. Modulus of rupture: Average of 6200 PSI (5.11 MPa), tested per STAM C99
    - d. Flexural strength: 5620 PSI (50.3 MPa), tested per ASTM C 880
    - e. Abrasion index: Minimum 62, tested per ASTM C 241
    - f. Thermal shock: Pass 5 cycles, tested per ASTM C 484
    - g. Thermal expansion:  $1.747 \times 10^{-5}$ , tested per ASTM C 531
    - h. Freeze thaw: Class MR3+, tested per ASTM 1026
    - i. Deicing: Pass ASTM C 672
    - j. Flame spread: Class 1 (FS-25 or less), tested per ASTM E84
    - k. Mohs hardness: 6 to 6.5
    - l. Stain resistance: Stains completely removed, tested per ASTM C 650, excluding hydroxide.
  3. Thickness: 3/4"
  4. Edge detail: Bullnose or miter edge, see detail on Contract Drawings.



5. Color: To be selected from manufacturer's colors in ALL price groups.
6. Surface finish: Polished.
7. Provide  $\frac{3}{4}$ " x 4" backsplash with profiled edges on all countertops unless noted otherwise.  
Provide  $\frac{3}{4}$ " x 4" side splashes with profiled edges where shown on the Contract Drawings.

### 2.03 SETTING MATERIALS

- A. Adhesive: Liquid nails or other approved by countertop manufacturer.

### 2.04 ACCESSORIES

- A. Epoxy Adhesive: K-bond epoxy type provided by countertop manufacturer.
- B. Joint Sealant: Single component silicone sanitary sealant and backing materials; specified in Section 079200 - Sealants.

### 2.05 FABRICATION

- A. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
- B. Form joints between components using manufacturer's standard joint adhesive.
  1. Reinforce as required.
  2. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
  3. Rout and finish component edges with clean, sharp returns.
  4. Rout cutouts, radii and contours to template.
- C. Smooth edges.

## PART 3 EXECUTION

### 3.01 JOB CONDITIONS

- A. Conditioning: Comply with manufacturer's recommendations for temperature and humidity requirements in installation areas. Do not install countertops until required temperature and relative humidity have been stabilized and will be maintained in installed areas.
- B. Do not install countertops until walls and ceilings of the spaces to receive the Work have been finished.

### 3.02 INSTALLATION

- A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturers requirements.
- B. Install in accordance with manufacturer's instructions.
- C. Provide factory cutouts for plumbing fittings and accessories.
- D. Provide surfaces with a uniform finish.
- E. Install countertop plumb, level, true and straight with no distortions. Shim as required using concealed shims.
  1. Tops:
    - a. Flat and true to within 1/8 inch of a flat surface over a 10-foot length.

- b. Allow a minimum of 1/16 inch to a maximum of 1/8 inch clearance between surface and each wall.
  - c. Form field joints using manufacturer's recommended adhesive, with joint widths no greater than 1/16 inch in finished work.
  - d. Keep components and hands clean when making joints.
- F. Where countertop abuts other finished work, scribe and cut for accurate fit.
- G. The party responsible for provision of countertops is also responsible for provision of penetrations through countertop; penetrations include but are not limited to cutouts for sinks, faucets, and soap dispenser.
- H. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Reinforce joints as required.
- I. Adhere sinks to tops using manufacturer's recommended sealant, adhesive and mounting hardware.
- J. Anchor countertop securely in place with concealed fasteners and adhesives as recommended by manufacturer.
- K. Provide backsplashes and side splashes as indicated on the Contract Drawings.
  - 1. Adhere to countertops using silicone sealant.

### 3.03 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed upon completion of installation.
- B. Do NOT allow harsh chemicals, such as lacquer thinner, turpentine, nail polish remover (acetone) or stove and drain cleaners, to REMAIN in contact with the surface. Hot pans and heat-producing appliances should be placed on heat shields or hot pads.
- C. Clean exposed and semi-exposed surfaces, touch-up as required. Remove and refinish damaged or soiled areas.
- D. Apply heavy kraft paper or other heavy protective coating masked in place to prevent surface damage. Remove kraft paper at building turn over to Owner and clean countertops.

**END OF SECTION 123661**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Solid surface material countertops.
  - 2. Solid surface material backsplashes.
  - 3. Solid surface material apron fronts.

## 1.03 ACTION SUBMITTALS

- A. Comply with Section 013300 - SUBMITTALS.
- B. Product Data: For countertop materials.
- C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
  - 1. Show locations and details of joints.
  - 2. Show direction of directional pattern, if any.
- D. Samples for Initial Selection: For each type of material exposed to view.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

## 1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

## 1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

## 1.07 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

## 1.08 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

## PART 2 - PRODUCTS

## 2.01 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. E. I. du Pont de Nemours and Company: Corian
    - b. Or approved equal.
  - 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

## 2.02 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMA/VI's "Architectural Woodwork Standards."
  - 1. Grade: Custom.
- B. Configuration:
  - 1. Front: Radius edge with apron - 2 inch high with 1/4 inch radius.
  - 2. Backsplash: Straight, with 1/4 inch radius top edge and vertical corner edges.
  - 3. End Splash: None.
- C. Countertops: 3/4 inch thick, solid surface material.
- D. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate with loose backsplashes for field assembly.
  - 2. Install integral sink bowls in countertops in the shop.
- E. Joints: Fabricate countertops without joints.
- F. Cutouts and Holes:
  - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
    - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
    - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
    - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
  - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
  - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

## 2.03 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
  - 1. Adhesives shall have a VOC content of 70 g/L or less.

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 - JOINT SEALANTS.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten subtops to cabinets by screwing through subtops into wall cleats. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
  1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- E. Install backsplashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- F. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- H. Apply sealant to gaps at walls; comply with Section 079200 - JOINT SEALANTS.

**END OF SECTION 123661.16**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Resilient entrance mats.
  - 2. Recessed frames.

## 1.03 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

## 1.05 WARRANTY

- A. Provide manufacturer's warranty

## PART 2 - PRODUCTS

## 2.01 MANUFACTURER

- A. Manufacturer: Forbo Flooring, Inc.
  - 1. Contact: 8 Maplewood Dr., Humboldt Industrial Park, P.O. Box 667, Hazleton, PA 18202; Telephone +800 842 7839 or +570 459 0771; Fax + 570 450 0258
  - 2. Or Approved Equal

## 2.02 INTERIOR ENTRANCE FLOORING

- A. Proprietary Product(s): Coral® Duo Entrance Flooring and Adhesive.
  - 1. Description: Incorporates alternating strips of Coral® Brush Activ and Coral® Classic, which are reinforced with tough resilient monofilament fibers. The Coral® Brush Activ strips are composed of capillary, active scraping, and heavy duty textured yarns. The Coral® Classic strips are composed of thin solution dyed yarns, thick monofilament yarns. The innovative EVERFORT® vinyl backing is a solid vinyl which is flexible, strong, and heavy in weight. It lays flat, making installation easier. It is impervious to water, making it suitable for intensive wet cleaning.
  - 2. Sizes:
    - a. Apparatus Bay to Corridor: 6' x 4'
    - b. Stair A to Exterior: 6' x 4'
    - c. Vendor Drop Off to Exterior: 3' x 5'
    - d. Gear Area to Exterior: 6' x 4'
    - e. Main Vestibule: 6'x 4'
  - 3. Gauge: 0.394"
  - 4. Backing: EVERFORT® vinyl
  - 5. Pattern and Color: [As selected by Architect from manufacturer's standard patterns and colors.

6. Adhesive: Forbo Flooring, Inc., FRS 885 Adhesive

### 2.03 FRAMES

- A. Recessed Frames: Manufacturer's standard extrusion or Model RF-14 by R.C. Musson Rubber Co.
  1. Extruded Aluminum: ASTM B221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
  2. Thickness: 1/4 inch
  3. Color: Clear Anodized.
  4. Install per manufacturer's recommendations to receive specified Mat and to accommodate specified flooring material outside frame

### 2.04 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
  1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
  1. In areas of tile flooring, coordinate recessed frame height with tile thickness to allow for aligned walking surface.
  2. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
  3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

3.03 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

**END OF SECTION 124813**



## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Structural-steel framing.
  - 2. Metal roof panels.
  - 3. Metal wall panels.
  - 4. Foam-insulation-core metal Wall and Roof panels.
  - 5. Thermal insulation.
  - 6. Doors and frames.
  - 7. Accessories.

## 1.03 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene two weeks before starting work of this section.
- B. Review materials, installation, protection, and coordination with other work.

## 1.05 ACTION SUBMITTALS

- A. Comply with Section 013300 - SUBMITTALS.
- B. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
  - 1. Structural-steel-framing system.
  - 2. Metal roof panels.
  - 3. Metal wall panels.
  - 4. Foam-insulation-core metal Wall panels.
  - 5. Roof Panels with thermal liner
  - 6. Thermal Insulation and vapor retarder facings.
  - 7. Flashing and trim. 0.034-inch
  - 8. Accessories.
- C. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
  - 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
  - 3. Metal Roof and Metal Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles,

corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

- a. Show roof-mounted items including stack type roof vents, penetrations and flashing with connections, rain collars, z channels and sealants required to mount and weatherproof new roof vent replacements for the metal building.
  - b. Show wall-mounted items including sliding door hardware including but not limited to:
  - c. Sliding door track rail and hangers, stop, end caps, cover flashing, door binders, door hanger/ roller trolleys, wall mounted door stays / rollers, door panels, door pulls, floor bolts/receivers and door end receivers.
4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):
- a. Flashing and trim.
  - b. Gutters.
  - c. Downspouts.
  - d. Louvers.
- D. Samples for Initial Selection: For units with factory-applied color finish.
- E. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.
- F. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified erector & manufacturer's professional engineer.
- B. Manufacturer Accreditation: Written certification prepared and signed by a Professional Engineer, licensed to practice in the state of New York verifying that the building system design and metal roof and wall systems design (including panels, clips, and support systems) meet the indicated loading requirements and codes of authorities having jurisdiction and produced by a manufacturer accredited according to the International Accreditation Service's IAS AC472.
- C. Welding certificates.
- D. Metal Building System Certification: For each type of metal building system, from manufacturer.
1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
    - a. Name and location of Project.
    - b. Order number.
    - c. Name of manufacturer.
    - d. Name of Contractor.
    - e. Building dimensions including width, length, height, and roof slope.
    - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
    - g. Governing building code and year of edition.
    - h. Design Loads: Include dead loads, live loads, collateral loads, snow loads (including drifting loads where applicable), deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, tributary load reductions (if applicable) and auxiliary loads (cranes).
    - i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
    - j. Building-Use Category: Indicate category of building use and its effect on load importance factors.

- E. Installer / Erector Qualifications Certification: Written certification that Installer/Erector has been regularly engaged, for the past 5 years, in the installation of metal building systems of similar type to that specified. Append a minimum of three recent project references with contact information to the certification submission.
- F. Manufacturer Product Certificates: Provide on the approved manufacturer's letterhead, certificates for each product being utilized on this project.
- G. Material Test Reports: For each of the following products:
  - 1. Structural steel including chemical and physical properties.
  - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
  - 4. Shop primers and paint systems for metal coil and panel systems.
  - 5. Nonshrink grout.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.
- I. Warranties: Sample of special warranties.

#### 1.07 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panel finishes - include in maintenance manuals.

#### 1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
  - 1. Accreditation: According to the International Accreditation Service's IAS AC472.
  - 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- F. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- G. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed in manufacturer's original, unopened containers and packaging with labels clearly identifying the product name and manufacturer. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in accordance with the manufacturer's instructions to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

### 1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements:
  - 1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
  - 2. Established Dimensions for Metal Panels: Field measurements shall be made prior to commencement of Sliding Door and roof vent Fabrications.

### 1.11 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 033000 - HISTORIC TREATMENT OF WOOD WINDOWS.
- B. Coordinate metal panel assemblies with flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

### 1.12 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty shall be signed by the metal building systems manufacturer and state that the coating contains 70 percent "Kynar 500" or "Hylar 5000" resin.
  - 2. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 3. Finish Warranty Period: 25 years from date of Substantial Completion.

- C. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
  - 1. Warranty Period: 25 years from date of Substantial Completion.
  - 2. Warranty shall be signed by both the manufacturer and the installer / erector.
- D. Warranty terms shall be submitted in writing with the bid submission package.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Metal Building System Manufacturer: Butler Manufacturing, PO Box 419917, Kansas City, Missouri 64141. Telephone: 816.968.3000. [www.buttermfg.com](http://www.buttermfg.com) (Basis of Design) or an approved equivalent by one of the following:
  - 1. Nucor Building Systems.
  - 2. VP Buildings; a United Dominion company.
  - 3. Star Building Systems.
- B. See Section 012500 - PRODUCT SUBSTITUTION PROCEDURES.

### 2.02 METAL BUILDING SYSTEMS

- A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
  - 1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated.
- B. Primary-Frame Type:
  - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of load-bearing end-wall and corner columns and rafters.
- D. End-Wall Framing: Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns.
- E. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.
- F. Eave Height: As indicated on the drawings.
- G. Bay Spacing: As indicated on the drawings..
- H. Roof Slope: as indicated on the drawings.
- I. Roof System: Manufacturer's standard vertical-rib, standing-seam field- insulated metal roof panels.
- J. Exterior Wall System: Manufacturer's standard pre-insulated metal wall panels as indicated on the drawings.

- K. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Rain Water Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

### 2.03 METAL BUILDING SYSTEM PERFORMANCE

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
  - 1. Design Loads: As indicated on Drawings.
  - 2. Design Loads: As required by MBMA's "Metal Building Systems Manual." ASCE/SEI 7. and as required by NYS IBC.
  - 3. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
    - a. Primary Framing: Roof Snow Load:  $L/180$
    - b. Primary Framing: Walls:  $H/60$  for 10-year wind load.
    - c. Secondary Framing:  $L/150$  for roof dead load + roof snow load; but not less than that required to maintain positive drainage for the greater of dead load +  $1/2$  roof snow load or dead load + 5 psf.
    - d. Secondary wall and roof framing:  $L/120$  for 10-year wind load.
    - e. Secondary Framing: Sheeting:  $L/180$  for roof snow load (but not less than 20 psf).
    - f. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
  - 4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E1592.
- C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. Collateral Load:
  - 1. Collateral load in pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings.
  - 2. This allowance does not include the weight of hung equipment weighing 50 pounds or more.
  - 3. Equipment loads of 50 pounds or more are indicated on the Drawings and the structure shall be strengthened as required.
  - 4. Architect will provide the metal building system manufacturer with the magnitude and approximate location of concentrated loads greater than 50 pounds before design of the building starts.
- E. Auxiliary Loads: Auxiliary loads shall include dynamic loads, such as cranes and material handling systems, and are as listed in the Contract Documents.
- F. Load Combinations: Load combinations used to design primary and secondary structural members shall be in accordance with the governing code.
- G. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other

detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (49 deg C), ambient; 180 deg F (82 deg C), material surfaces.
- H. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E1680 at negative test-pressure difference of 1.57 lbf/sq. ft.
- I. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft.
- J. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.
- K. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C1363 or ASTM C518:
1. Metal Roof Panel Assemblies:
    - a. R-Value: 30 for a system height of 9.25".
  2. Metal Wall Panel Assemblies:
    - a. R-Values: 30.86 for 4" thick panels, 00
- L. Energy Performance: Provide roof panels that are listed on the DOE's ENERGY STAR Roof Products Qualified Product List for low -slope roof products.

#### 2.04 STRUCTURAL-STEEL FRAMING

- A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
  2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
  3. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
  4. Frame Configuration: Gable - Rigid Frame.
  5. Exterior Column Type: Tapered.
  6. Rafter Type: Tapered.
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
  2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
1. Purlins: 'Z'-shaped sections; precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified load conditions, minimum 2-1/2-inch wide flanges.

- a. Depth: As needed to comply with system performance requirements.
  - 2. Eave Struts: Unequal-flange, C-shaped sections; precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified load conditions; to provide adequate backup for metal panels.
    - a. Depth: as indicated on the drawings.
  - 3. Girts: 'C' or 'Z'-shaped sections; precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified load conditions, minimum 2-1/2-inch wide flanges.
    - a. Depth: As needed to comply with system performance requirements.
  - 4. Flange Bracing: Minimum 2 inch by 2 inch by 1/8 inch structural-steel angles or 1 inch diameter, cold-formed structural tubing to stiffen primary-frame flanges.
  - 5. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
  - 6. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
- D. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.
- 1. Type: Box Type .
- E. Bracing: Provide adjustable wind bracing as follows:
- 1. Cable: ASTM A475, 1/4-inch (6 mm) diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
  - 2. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- F. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.
- G. Materials:
- 1. W-Shapes: ASTM A992/A992M; ASTM A572/A572M, Grade 50 or 55; or ASTM A529/A529M, Grade 50 or 55.
  - 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55; or ASTM A529/A529M, Grade 50 or 55.
  - 3. Plate and Bar: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55; or ASTM A529/A529M, Grade 50 or 55.
  - 4. Steel Pipe: ASTM A53/A53M, Type E or S, Grade B.
  - 5. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B or C, structural tubing.
  - 6. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
    - a. Configuration: Straight.
    - b. Nuts: ASTM A563 heavy-hex carbon steel.
    - c. Plate Washers: ASTM A36/A36M carbon steel.
    - d. Washers: ASTM F436/F436M hardened carbon steel.
    - e. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.
- H. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
- 1. Prime galvanized members with specified primer after phosphoric acid pretreatment.

## 2.05 METAL ROOF SYSTEM (MR-24)

- A. Metal Roof System: Butler Manufacturing "MR-24®" roof system.



- B. Roof System Design:
  - 1. Design roof panels and liner panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
  - 2. Design roof paneling system to support design live, snow, and wind loads.
  - 3. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.
- C. Roof System Performance Testing:
  - 1. UL Wind Uplift Classification Rating, UL 580: Class 90.
  - 2. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E1592.
  - 3. Roof system has been tested in accordance with U.S. Army Corps of Engineers Unified Facilities Guide Specification Section 076113.
  - 4. FM Global (Factory Mutual):
    - a. Roof system has been tested in accordance with FMRC Standard 4471 and approved as a Class 1 Panel Roof.
    - b. Metal Building System Manufacturer: Provide specific assemblies to meet required wind rating in accordance with FM Global.
    - c. Installation modifications or substitutions can invalidate FM Global approval.
- D. Roof Panels:
  - 1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
  - 2. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
  - 3. Variable Width Panels:
    - a. For roof lengths not evenly divisible by the 2'-0" panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
    - b. Minimum Length: 15 feet.
    - c. Supply maximum possible panel lengths.
  - 4. Panel Material and Finish:
    - a. 24-gauge galvanized steel, G90 coating; ASTM A653/A653M, G90.
    - b. Paint with exterior colors of "Butler-Cote™" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
    - c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
      - 1) Not to peel, crack, or chip.
      - 2) Chalking: Not to exceed ASTM D4214, #8 rating.
      - 3) Fading: Not more than 5 color-difference units, ASTM D2244.
  - 5. Use panels of maximum possible lengths to minimize end laps.
  - 6. Extend eave panels beyond structural line of sidewalls.
  - 7. Factory punch panels at panel end to match factory-punched holes in eave structural member.
  - 8. Panel End Splices: Factory punched and factory notched.
  - 9. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.
  - 10. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
  - 11. Self-Drilling Fasteners: Not permitted in weathering membrane of roof system.
  - 12. Ridge Assembly:
    - a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.
    - b. Factory punch parts for correct field assembly.

- c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.
  - d. Do not expose attachment fasteners on weather side.
  - e. Use lock seam plug to seal lock seam portion of panel.
  - f. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.
- E. Insulation System:
  - 1. Roof Insulation System: Butler Manufacturing™ "ThermaLiner™" roof insulation system
    - a. Sub-Structural System:
      - 1) 3-inch nominal zee-shaped members (nominal 0.060-inch-thick, acrylic-coated, galvanized steel), factory punched for specific roof system being installed.
      - 2) Support Brackets: 3-inch, 5-inch, or 8-inch height support zee and provide space for various thicknesses of insulation. Install with self-drilling fasteners through interior liner panel and into building structure.
    - b. Insulation:
      - 1) Unfaced Insulation: NAIMA 202
      - 2) Top Layer of Blanket Insulation: 3-inch-thick insulation installed between roof panels and 3-inch zee
        - (a) Furnish insulation in rolls of 3-foot, 4-foot, 5-foot, or 6-foot width.
      - 3) Bottom Layer of Blanket Insulation: Furnish in rolls of 3-foot, 4-foot, 5-foot, or 6-foot width or 5-foot by 5-foot batts.
        - (a) Thickness of Bottom Layer: 6" (R-19)
      - 4) Zee Member: Insulated using 3/4-inch-nominal-thick extruded polystyrene foam insulation block along each zee location to minimize thermal break between zee and roof panels.
- F. Vapor Retarder:
  - 1. PSK Light Duty (WMP-VR) 0.0015-inch minimum thickness, UV-stabilized, white polypropylene, laminated to 11-pound Kraft paper / metalized polyester and reinforced with glass fiber and polyester scrim.
  - 2. Perm Rating: 0.09.
- G. Interior Liner Panels:
  - 1. Form panels from 0.0149 - inch minimum total coated thickness coated steel with minimum yield strength of 80,000 psi.
  - 2. Painted Panel Finish:
    - a. Exposed Side: 0.15-mil min primer and 0.70-mil minimum interior white polyester paint.
    - b. Unexposed Side: 0.1-mil minimum primer and 0.40 minimum polyester backer
    - c. Panel Dimensions: Nominal 36 inches wide with corrugations 1/2 inches high, 3 inches on center.
  - 3. Factory cut panels to lengths required.
- H. Provision for Expansion and Contraction:
  - 1. Provision for Thermal Expansion Movement of Roof Panels: Clips with movable tab.
    - a. Stainless Steel Tabs: Factory centered on roof clip to ensure full movement in either direction.
    - b. Maximum Force of 8 Pounds: Required to initiate tab movement.
    - c. Each Clip: Accommodates a minimum of 1.25-inch movement in either direction.
  - 2. Roof: Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100-degree F temperature difference between interior structural framework of building and of roof panels.
- I. Fasteners:

1. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless steel tabs, seamed into standing seam side lap.
  2. Fasten insulation board, bearing plates, and panel clips to structural members with "Scrubolt™" fasteners in accordance with erection drawings furnished by metal building system manufacturer, using factory-punched or field-drilled holes in structural members.
    - a. Fasteners: Metal-backed rubber washer to serve as torque indicator.
  3. Fasteners penetrating metal membrane at the following locations do not exceed the frequency listed:
    - a. Basic Panel System: 0 per square foot.
    - b. High Eave Trim, No Parapet: 2 per linear foot.
    - c. Exterior Eave Gutter: 2 per linear foot.
    - d. Panel Splices: 2 per linear foot.
    - e. Gable Trim: 0 per linear foot.
    - f. High Eave with Parapet: 0 per linear foot.
    - g. Ridge: 0 per linear foot.
    - h. Low Eave Structural: 1.5 per linear foot.
- J. Accessories:
1. Accessories (i.e., gutters, fascia, and trim): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
  2. Metal Coating on Gutters, Downspouts, Gable Trim, and Eave Trim: "Butler-Cote™" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
  3. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.
  4. Material used in flashing and transition parts and furnished as standard by metal building system manufacturer may or may not match roof panel material.
    - a. Parts: Compatible and not cause corrosive condition.
    - b. Copper and Lead Materials: Do not use with Galvalume or optional aluminum-coated panels.
- K. Thermal Performance:
1. Determine thermal performance in accordance with ASTM C 1363 and test U-factors for composite roof section.
  2. "Thermax" Insulation Thicknesses: Maximum 4 inches.
- L. Physical Properties:
1. WMP-VR Vapor Retarder:
    - a. Water Vapor Permeance (perm) Rating, ASTM E96/E96M: 0.09.
    - b. Minimum Workability Temperature: 40 degrees F.
  2. Vapor Retarder UL Fire Hazard Classification Ratings, UL 723:
    - a. WMP-VR Vapor Retarder:
      - 1) Flame Spread: 10.
      - 2) Smoke Development: 10.
  3. Insulation Board Facing:
    - a. Water Vapor Permeance (perm) Rating, ASTM E96/E96M: 0.03.
  4. "Thermax" Metal Building Board Insulation:
    - a. Class I Factory Mutual Approval and UL Fire Hazard Classification Ratings, UL 723:
      - 1) Flame Spread: 25 or less.

## 2.06 METAL ROOF PANEL ACCESSORIES

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.

- B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
- C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Provide corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- D. Joint Sealers: Provide Tape Mastic Sealants and Concealed Joint Sealants per Section 079200 - JOINT SEALANTS.
- E. Roof Accessories: Approved by metal panel manufacturer. Refer to Section 077200 - ROOF ACCESSORIES - HATCHES, SUPPORTS, AND CURBS for requirements for heat and smoke vents, and preformed flashing sleeves.
- F. Snow Guards: Compatible with standing seam roof and approved by metal panel manufacturer. Refer to Section 077253 - SHEATHING for requirements for snow guards attached to metal roof panels.

#### 2.07 METAL WALL SYSTEM (BUTLER THERMAWALL TM FLAT)

- A. Exterior Metal Wall System: Butler Manufacturing™ “Butler Thermawall TM Flat” wall system.
- B. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. Wall Panels:
  - 1. Steel-faced, shop-assembled, factory-foamed, insulated panel units.
  - 2. Double tongue-and-groove, side-joint design, with fasteners concealed within side joint.
  - 3. Nominal Thickness: 4 inches.
  - 4. One piece from base to top of wall.
  - 5. Maximum Panel Length: 40 feet.
  - 6. Exterior Face:
    - a. Nominal Width: 36 inches.
    - b. Roll-formed, flat surface from galvanized steel.
    - c. Finish: Non-directional embossed finish.
  - 7. Interior Face: Roll-formed from pre-painted steel with 1/16-inch-deep corrugations on 6-inch centers.
- D. Panel Material and Finish:
  - 1. Corrugated Exterior-Faced Panels: 22-gauge, AZ50 aluminum-zinc coated steel.
  - 2. Interior Face: 26-gauge, AZ50 aluminum-zinc coated steel.
  - 3. Core: Poured-in-place polyurethane foam with a minimum 93 percent closed-cell structure.
  - 4. Exterior Panel Finish: Pre-finished with “Butler-Cote™” finish system, full-strength, 70 percent Kynar 500 fluoropolymer (PVDF) coating in metal building system manufacturer’s standard colors.
  - 5. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
    - a. Not to peel, crack, or chip.
    - b. Chalking: Not to exceed ASTM D4214, #8 rating.
    - c. Fading: Not more than 5 color-difference units, ASTM D2244.
  - 6. Interior Panel Finish: Paint with USDA-approved interior white polyester paint.
- E. Panel Physical Properties:
  - 1. Calculated U-Value: Based on actual test results from ASTM C 518 of panel core material.

- a. 4-Inch-Thick Panels: 0.034.
- 2. Insulated Panels:
  - a. Factory Mutual Class 1 Rating for wall and ceiling construction FM 4880.
  - b. Guide NYWR, Insulated Wall Construction Subject 1040.
  - c. Surface Burning Characteristics: Panel core (6-inch unfaced) tested in accordance with ASTM E 84.
    - 1) Flame Spread: 25.
    - 2) Smoke Developed: 450.
- F. Fasteners:
  - 1. Base, Top, and Girt Connections and Panel Joint Clip Attachments: #14 self-drilling screws.
    - a. Install additional "Lockrivet" fasteners, if necessary due to wind load.
  - 2. Panel-to-Panel Fasteners:
    - a. Connections: Hidden, eliminating exposed fasteners.
- G. Accessories:
  - 1. Accessories (i.e., doors, windows): Design to fit wall panel system or framed openings and furnish as standard by metal building system manufacturer, unless otherwise noted.
  - 2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

## 2.08 METAL WALL PANEL ACCESSORIES

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panels.
- C. Panel Clips: ASTM A653/A653M, G90 (Z180) hot-dip galvanized zinc coating, one-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- D. Panel Fasteners: Self-drilling or Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- E. Joint Sealers:
  - 1. Sealants: Provide Tape Mastic Sealants, Non-skinning sealants, and Urethane Sealants in accordance with manufacturers standards
  - 2. Vertical Joint Gasket: Manufacturers standard EPDM gasket. Color: As selected by the Architect from the manufacturer's full color offering.
- F. Materials:
  - 1. Polyisocyanurate Insulation: Modified polyisocyanurate foam using a non-CFC blowing agent, foamed-in-place or board type as indicated, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
    - a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
  - 2. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755/A755M.
    - a. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
    - b. Surface: Smooth, flat finish.

## 2.09 DOORS AND FRAMES

- A. Swinging Personnel Doors and Frames: As specified in Section 081113 - HOLLOW METAL DOORS AND FRAMES.
- B. Finishes for Personnel Doors and Frames:
  - 1. Prime Finish: Factory-apply manufacturer's standard primer immediately after cleaning and pretreating.
- C. Overhead Doors: Specified in Section 083613.
- D. Overhead Door Frame: Manufacturer's standard as indicated on the drawings.

## 2.10 WINDOWS

- A. See Section 085113 - Aluminum Windows for information.

## 2.11 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
  - 1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
  - 1. Closures: Provide closures at ridge roof ventilator openings, fabricated of same material as metal roof panels.
  - 2. Clips: Manufacturer's standard, formed from stainless-steel sheet, designed to withstand negative-load requirements.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
- D. Flashing and Trim: Formed from 0.034-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
  - 1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, corners, bases, framed openings, ridges, and fillers.
  - 2. Opening Trim: Formed from 0.034-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Formed from 0.040 inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof

fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch (2438-mm) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
  2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Formed from 0.034-inch nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot (3-m) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Louvers: See Section 089119 for louvers. Provide opening, sill and head flashing as specified in this section to finish each gable end fan opening.
1. Blades: Fixed
  2. Free Area: Not less than 7.0 sq. ft. for 48-inch wide by 48-inch high louver.
  3. Bird Screening: Galvanized steel, 1/2-inch square mesh, 0.041-inch wire; with rewirable frames, removable and secured with clips; fabricated of same kind and form of metal and with same finish as louvers.
    - a. Mounting: Interior face of louvers.
  4. Vertical Mullions: Provide mullions at spacings recommended by manufacturer, or 72 inches o.c., whichever is less.
- H. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
    - a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
    - b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panels.
    - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
    - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
  2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
  3. Metal Panel Sealants:
    - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
    - b. Joint Sealant: ASTM C920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

## 2.12 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

- B. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
  - 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

#### 3.03 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.



1. Level and plumb individual members of structure.
  2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for bolt type and joint type specified.
    - a. Joint Type: Snug tightened or pretensioned.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
  2. Locate and space wall girts to suit openings such as doors and windows.
  3. Locate canopy framing as indicated.
  4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
  2. Locate interior end-bay bracing only where indicated.
- J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

### 3.04 METAL PANEL INSTALLATION, GENERAL

- A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
  2. Install metal panels perpendicular to structural supports unless otherwise indicated.
  3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
  6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.

### 3.05 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

### 3.06 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
  2. Shim or otherwise plumb substrates receiving metal wall panels.
  3. When two rows of metal panels are required, lap panels 4 inches minimum.
  4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
  5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
  6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  7. Install screw fasteners in predrilled holes.
  8. Install flashing and trim as metal wall panel work proceeds.
  9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
  10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.07 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
  - 1. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
  - 1. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.

### 3.08 DOOR AND FRAME INSTALLATION

- A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.
- B. Personnel Doors and Frames: Install doors and frames according to ANSI/SDI A250.8. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
  - 1. Between Doors and Frames at Jambs and Head: 1/8 inch (3 mm).
  - 2. Between Edges of Pairs of Doors: 1/8 inch.
  - 3. At Door Sills with Threshold: 3/8 inch.
  - 4. At Door Sills without Threshold: 3/4 inch.
  - 5. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.

### 3.09 WINDOW INSTALLATION

- A. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- B. Mount screens directly to frames with tapped screw clips.

### 3.10 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for complete metal roof ventilator assemblies, including flashing, rain collars, ridge closures, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 2. Install components for complete metal wall sliding door assemblies, including trim, corners, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 30 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
  1. Provide elbows at base of downspouts to direct water away from building.
  2. Tie downspouts to underground drainage system indicated.
- E. Louvers: Locate and place louver units level, plumb, and at indicated alignment with adjacent work.
  1. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
  2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.
  3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of corrosion-resistant paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
  4. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 - JOINT SEALANTS for sealants applied during louver installation.

### 3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  1. Inspection of fabricators.
  2. Steel construction.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:
  1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490."
  2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
    - a. Liquid Penetrant Inspection: ASTM E165/E165M.
    - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E164.
    - d. Radiographic Inspection: ASTM E94/E94M.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.12 ADJUSTING

- A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
- B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.
- C. After completing installation, including work by other trades, lubricate, test, and adjust units to operate easily and be free of warp, twist, or distortion as needed to provide fully functioning units.

### 3.13 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
  - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
  - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 - Exterior Painting and 099123 - Interior Painting
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
  - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
  - 1. Immediately before final inspection, remove protective wrappings from doors and frames.
- F. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.
- G. Louvers: Clean exposed surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
  - 1. Restore louvers damaged during installation and construction period so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
    - a. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

**END OF SECTION 133419**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes passenger elevators including but not limited to:
  - 1. Pre-engineered MRL Traction passenger elevator.
  - 2. Elevator Car enclosure, hoistway entrances and signal equipment.
  - 3. MRL Equipment
  - 4. Operation and control systems.
  - 5. Accessibility provisions for physically handicapped persons.
  - 6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated capacity and speed.
  - 7. Materials and accessories as required to complete the elevator installation.
  - 8. Inserts mounted in block walls for rail attachments.
  - 9. Furnish elevator hoistbeam and safety tube. Installation by General Contractor.
  - 10. Furnish and install pit ladder.

## 1.03 RELATED SECTIONS:

- A. Section 015000 - Temporary Facilities and Controls: protection of openings and personnel barriers, temporary power and lighting including but not limited to:
  - 1. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
  - 2. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway
- B. Section 033000 - CAST-IN PLACE CONCRETE for setting sleeves, inserts, and anchoring devices in concrete.
- C. Section 042200 - CONCRETE UNIT MASONRY for setting sleeves, inserts, and anchoring devices and coordinating wall openings for oil line and wiring ducts in masonry and for grouting elevator entrance frames installed in masonry walls.
- D. Section 051200 - Structural Steel Framing for the following:
  - 1. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
  - 2. Divider beams.
  - 3. Structural-steel shapes for subsills that are part of steel frame.
- E. Section 055000 - METAL FABRICATIONS for the following:
  - 1. Attachment plates and angle brackets for supporting guide-rail brackets.
  - 2. Divider beams.
  - 3. Hoist beams furnished by Elevator Company, installed by General Contractor.
  - 4. Structural-steel shapes for subsills.
  - 5. Pit ladders.
  - 6. Cants in hoistways made from steel sheet.
- F. Division 07: Waterproofing: waterproofing of elevator pits.

- G. Division 08: Openings: Access Doors: As required for access to governor and/or seismic switch. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.
- H. Division 09 for finish flooring in elevator cars.
- I. Section 099123 - INTERIOR PAINTING for field painting of hoistway entrance doors and frames.
- J. Section 223500 - for sump pumps, oil interceptors, sumps, and sump covers in elevator pits.
- K. Division 26 for:
  - 1. Smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.
  - 2. Providing electrical service to elevator, including fused disconnect switches.
  - 3. Emergency power supply, transfer switch and auxiliary contacts.
  - 4. Convenience outlets and illumination in Machine Room, hoistway and pit.
  - 5. Light outlet in the center of hoistway as indicated by the elevator contractor.
  - 6. Standby Power Supply Systems: emergency generator for elevator operations.
  - 7. Telephone Systems: ADAAG required emergency communications systems.
  - 8. Provision of telephone and convenience outlet on control panel.
- L. Division 23: Heating, Ventilating and Air Conditioning:
  - 1. Heating and Ventilating of hoistways and Machine Rooms.

#### 1.04 REGULATORY REQUIREMENTS

- A. 29 CFR 1926.502 - Fall protection systems criteria and practices; Current Edition.
- B. ADA Standards - Americans with Disabilities Act Accessibility Guidelines.
- C. ASME A17.1 - Safety Code for Elevators and Escalators; 2019.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- E. ISO 9001 - Quality management systems -- Requirements; 2015.
- F. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.
- I. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- J. ICC A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.

#### 1.05 SYSTEM DESCRIPTION

- A. Application: Machine Room Less (MRL).

- B. Machine Location: Top of the hoistway mounted on car and counterweight guide rails.
- C. Control Space Location: Top landing entrance frame.
- D. Elevator Types and Performance Requirements:

|     |                           |                                               |
|-----|---------------------------|-----------------------------------------------|
| 1.  | Quantity of Elevators:    | One (1)                                       |
| 2.  | Elevator Model:           | Kone MonoSpace 300                            |
| 3.  | Operation System:         | Simplex                                       |
|     | Drive:                    | Non-Regenerative                              |
| 4.  | Elevator Number(s):       | Elevator No. No. 1                            |
| 5.  | Service:                  | General Service                               |
| 6.  | Number of stops /opgs.    |                                               |
|     | Elevator No. 1            | Two (2) Stops / Both front                    |
| 7.  | Travel:                   |                                               |
|     | Elevator No. 1            | 14'-0"                                        |
| 8.  | Rated Capacity:           |                                               |
|     | All Elevators             | 2500 lb. capacity                             |
| 9.  | Speed:                    |                                               |
|     | All Elevators             | 150 fpm                                       |
| 10. | Cab Size:                 |                                               |
|     | Elevator No. 1            | 6"-10 5/8" wide by 5'-10 1/16" deep           |
| 11. | Cab Heights:              | All 7'-6" height nominal or as indicated.     |
| 12. | Hoistway Entrance Size:   | All 3'-6" wide x 7'-0" high                   |
| 13. | Door Type:                | Two Speed Side-Slide                          |
| 14. | Power Characteristics:    | 208 volts, 3 Phase, 60 Hz.                    |
| 15. | Seismic:                  | No                                            |
| 16. | Fixture and Button Style: | Stainless Steel 301 Push Buttons.             |
| 17. | Special Operations:       | Fire Service Phase 1 and Fire Service Phase 2 |

E. Ride Quality:

|    |                                 |                                                 |
|----|---------------------------------|-------------------------------------------------|
| 1. | Vertical Vibration (maximum):   | 15 mg                                           |
| 2. | Horizontal Vibration (maximum): | 12 mg                                           |
| 3. | Vertical Jerk (maximum):        | 3 ft/sec <sup>3</sup> (1m/s <sup>3</sup> )      |
| 4. | Acceleration (maximum):         | 1.3 ft/sec <sup>2</sup> (0.4 m/s <sup>2</sup> ) |
| 5. | In Car Noise:                   | 55 dB(A) Maximum                                |
| 6. | Stopping Accuracy:              | ±0.2 inches (5 mm)                              |
| 7. | Starts per hour (maximum):      | 180                                             |

F. Elevator Operation:

- 1. a. Simplex Collective Operation: Using a microprocessor based controller, operation shall be automatic by means of the car and hall buttons. When all calls have been answered, the car shall park at the last landing served.

G. Operating Features - Standard:

- 1. Door Light Curtain Protection
- 2. Static AC Drive
- 3. Phase Monitor Relay
- 4. Cab Overload with Indicator
- 5. Load-weighing



6. Central Alarm
7. Remote Monitoring
8. Firefighter's Operation
9. Automatic Evacuation
  - a. When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. If the car is at a floor when the power fails, it remains at that floor, opens its doors, and shuts down. If the car is between floors, it is raised or lowered to the first available landing, opens its doors, and shuts down.
10. Independent Service

#### 1.06 ACTION SUBMITTALS

- A. Comply with Section 013300 - SUBMITTALS.
- B. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- C. Shop Drawings:
  1. Include plans, elevations, sections, and large-scale details indicating service at each landing, pit and hoistway, erection and anchorage, details of assembly and coordination with building structure, relationships with other construction, and locations of equipment.
  2. Include equipment arrangements in the control space, pit and hoistway.
  3. Include large-scale layout of car-control station.
  4. Indicate floors served, travel distances, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
  5. Indicate electrical power requirements, Horsepower, starting current, running current, machine and control heat release and branch circuit protection devices recommended.
- D. Samples for Initial Selection: For finishes involving color selection such as powder coating, plastic laminates, metals and other exposed finishes requiring selection.
- E. Operation and Maintenance Manual: Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogs; and electrical wiring diagrams.
- F. Warranty: Submit manufacturer/installer's standard warranty.

#### 1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.
- C. Sample Warranty: For special warranty.

#### 1.08 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals, wiring diagrams and Parts list with recommended parts inventory.

1. In addition to items specified in Section 017823 - OPERATING AND MAINTENANCE DATA include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

#### 1.09 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen (15) years experience in manufacturing, installing, and servicing elevators of the type required for the project.
  1. Must be the manufacturer of the power unit, controller, signal fixtures, door operators cab, entrances, and all other major parts of the elevator operating equipment.
    - a. The major parts of the elevator equipment shall be manufactured in the United States, and not be an assembled system.
    - b. All safety components must be certified by a qualified 3rd party certification body (ie. Safety, governor, brakes, rope grippers, ascending car protection, and door locks).
  2. The manufacturer shall have a documented, on-going quality assurance program.
  3. ISO 9001:2000 Manufacturer Certified
  4. ISO-14001:2004 Environmental Management System Certified.
- B. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer. Installer shall have a least fifteen (15) years of satisfactory experience installing elevators equal in scope, character and performance to the project elevators.
- C. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL 10B, and NFPA 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory.
- D. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
  1. Arrange for inspections and make required tests.
  2. Deliver to the Owner upon completion and acceptance of elevator work.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.
- B. Manufacturer will deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site in accordance with manufacturer/installer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

#### 1.11 PROJECT CONDITIONS

- A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

- B. General Construction Contractor shall coordinate the provisions for temporary electric and GFCI-protected electricity to be available for the installation of elevator components.
- C. General Construction Contractor shall provide a temporary work platform at the top floor of the hoistway compliant with applicable codes and in accordance with the layout drawing specification provided by the approved elevator manufacturer.

#### 1.12 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work relating to the elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, and pits.
- C. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

#### 1.13 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
  - 2. Warranty Period: One (1) year from date of Substantial Completion.

#### 1.14 MAINTENANCE

- A. Furnish maintenance and 24-hour, 7 days a week call back service for a period of 12 months for each elevator from date of Substantial Completion during normal working hours, excluding callbacks. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.
  - 1. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.
  - 2. Elevator maintenance service shall be performed by elevator manufacturer/installer.
- B. Elevator Control System:
  - 1. Include built-in remote diagnostic module to relay constant status of elevators and control system to a 24-hour, 7-days-a-week central-monitoring facility.
  - 2. Remote Monitoring Device: Transmit information on current status of elevators, including malfunctions, system errors, and shutdown.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by Kone Elevator 4225 Naperville Road, Lisle, IL 60532. Phone (630) 577-1650. Website [www.kone.us](http://www.kone.us).
  - 1. Architect approved equivalent.
- B. Source Limitations: Obtain elevators from single manufacturer.
  - 1. Major elevator components, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.
- C. Elevator shall be installed by elevator manufacturer or an manufacturers approved / licensed installer.

## 2.02 MATERIALS, GENERAL

- A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD and shall be as selected by the Interior Designer.
- B. Colors, patterns, and finishes: As selected by the Architect or Interior Designer from manufacturer's standard colors, patterns, and finish charts.
- C. Steel:
  - 1. Shapes and bars: Carbon.
  - 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
  - 3. Finish: Factory-applied baked enamel.
- D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection shall be based on elevator manufacture's standard selections.
- E. Floor Finish: By others. See Division 09 and indicated finish on the drawings.

## 2.03 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1.
- B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

## 2.04 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microprocessor based control system to perform all of the functions of safe elevator operation, as well as perform car and group operational control.
  - 1. All high voltage (110v or above) contact points inside the inspection and test panel shall be protected from accidental contact in a situation where the access panels are open.
  - 2. The controller shall be distributed throughout the elevator system located in the overhead, cab and inspection and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be located in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.

3. Provide multi-bus control architecture to reduce cabling, material and waste.
- B. Drive: Provide a Variable Voltage Variable Frequency AC Closed Loop drive system. Provide stable start without high peak current, quickly reaching a low energy consumption level.
- C. Inspection and Test Panel: Integrated control equipment, main inspection and test panel in door frame at top level served or at one floor below the top level served.

## 2.05 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine:
  1. Gearless asynchronous AC motor with integral drive sheave, service and emergency brakes.
  2. Design machine to enable direct power transfer, thereby avoiding loss of power.
  3. Design machine to be compact, lightweight and durable to optimize material usage and save space.
  4. Mount to structural support channels on top of guide rail system as applicable in hoistway overhead.
- B. Governor:
  1. Tension type over-speed governor with remote manual reset.
  2. Mount to structural support channels as applicable in hoistway overhead.
- C. Buffers, Car and Counterweight: Compression spring type buffers to meet code.
- D. Hoistway Operating Devices:
  1. Emergency Stop switch in the pit.
  2. Terminal stopping switches.
  3. Emergency stop switch on the machine.
- E. Positioning System: System consisting of proximity sensors and door zone vanes.
- F. Guide Rails and Attachments: Provide Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
- G. Suspension System: Industry standard steel wire rope.
- H. Governor rope: Steel wire rope with 6 mm diameter.

## 2.06 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Doors and Frames:
  1. UL rated with required fire rating.
  2. Doors: Rigid flush panel construction with reinforcement ribs.
  3. Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.
- B. Finish:
  1. Exposed Areas of Corridor Frames: #4 Brushed Stainless Steel - All Floors
  2. Doors: #4 Brushed Stainless Steel - All Floors
  3. Sills: Aluminum - All Floors
- C. Entrance Markings and Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

## 2.07 EQUIPMENT: CAR COMPONENTS

- A. Car Frame and Safety: Provide car frame with adequate bracing to support the platform and car enclosure. The safety shall be integral to the car frame and shall be flexible guide clamp type.
- B. Platform: Provide platform of steel construction with plywood subfloor and aluminum threshold.
- C. Car Guides: Provide sliding guide shoes mounted to top and bottom of both car and counterweight frame. Arrange each guide shoe assembly to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Provide central guiding system to reduce mechanical friction and energy consumption.
- E. Steel Cab:
  - 1. Fire rating: Provide Class B fire rating for cab, or Class A fire rating where required by local Code.
  - 2. Car wall finish: Wood Laminate, final color to be determined by AOR and owner for Elevator(s) No. 1.
  - 3. Base and frieze: #4 Brushed Stainless Steel.
  - 4. Car front finish: #4 Brushed Stainless Steel.
  - 5. Car door finish: #4 Brushed Stainless Steel on Cab side, Baked Enamel on Lobby side. Color to be determine by Architect from Manufacturer's full range.
  - 6. Ceiling: Canopy ceiling, Rectangular, LED Spotlights (CL94\*\*) Brushed Stainless Steel (4SS)
  - 7. Handrail: Provide 1 1/2 inch Round on side and rear walls. Handrails shall have a #4 Brushed Stainless Steel finish.
  - 8. Flooring: See Finish Schedule. Note: Not to exceed 1/2" finished depth and 3lbs/sqft.
  - 9. Ventilation: Manufacturer's standard cab fan.
  - 10. Emergency Car Lighting: Provide an emergency power unit employing a 12 volt sealed rechargeable battery and static circuits to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
  - 11. Emergency Siren: Provide siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
  - 12. Emergency Exit Switch: Provide an electrical contact to open the safety circuit when the emergency car top exit is opened. When the exit door is opened, the top exit switch shall signal the control and the car will be unable to move.
  - 13. Emergency Exit Lock: Provide an emergency exit lock where required by local code.

## 2.08 DOOR OPERATOR AND REOPENING DEVICES

- A. Door Operator: Provide a closed loop VVVF high performance door operator with frequency controlled drive for fast and reliable operation to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. In case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.

- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. Provide door open button in the car operating panel. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Provide door hangers and tracks for each car and hoistway door. Contour tracks to match the hanger sheaves. Design hangers for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed for life bearings.
- E. Electronic Door Safety Device: Equip car doors with concealed transmitter and receiver infrared beam devices to detect presence of object in process of passing through hoistway entrance and car doorway (light curtain device).
  - 1. Use multi-beam scanning without moving parts to detect obstructions in door opening.
  - 2. Detector Device: Prevent doors from closing, or if they have already started closing, cause doors to reopen and remain open while object is within detection zone.
  - 3. Horizontal Beams: Minimum of 33 infra red beams to fill doorway from ground level to a height of 6 feet.

## 2.09 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide a car operating panel with all push buttons, key switches and message indicators for elevator operation. Fixture finish to be Brushed Stainless Steel.
  - 1. Main Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have Amber Dot Matrix illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be Amber Dot Matrix. All texts, when illuminated, shall be Amber Dot Matrix. The car operating panel shall have a Brushed Stainless Steel finish.
  - 2. Comply with handicap requirements.
  - 3. Emergency Buttons: Provide in accordance with code. Emergency alarm button, door open and door close buttons.
- B. Features of the Car Operating Panel Shall Include:
  - 1. Audible chime to signal that the car is either stopping at or passing a floor served by the elevator.
  - 2. Raised markings and Braille provided to the left hand side of each push button.
  - 3. Car Lantern: Provide LED illuminated car lantern with direction arrows to comply with local code when hall lanterns are not provided.
  - 4. Door open and close push buttons.
  - 5. Firefighter's hat and Phase 2 Key-switch
  - 6. Inspection key-switch.
  - 7. Key-switch for optional Independent Service Operation
  - 8. Illuminated alarm button with raised marking.
  - 9. Elevator Data Plate marked with elevator capacity and car number.
  - 10. Help Button: Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
- C. Hall Fixtures: Provide hall fixtures with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a Brushed Stainless Steel finish.
  - 1. Push buttons: Metallic tactile push buttons, up button and down button at intermediate floors, single button at each terminal floor.

2. Height: Comply with handicap requirements.
  3. Illumination: Illuminating using long-lasting low power LEDs.
- D. Hall Lanterns and Position Indicators.
1. LED illuminated direction arrows with audible and visible call acknowledgement.
- E. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound. The chime will sound once for up and twice for down. The car riding lantern face plate shall have a Brushed Stainless Steel finish
- F. Hoistway access switches: Provide key-switch at top and/or bottom floor in entrance jamb as required by local code.
- G. Firefighter's Phase 1 Service: Key switch in brushed stainless steel cover plate.
- H. Fixture Cover Plates: For push buttons, hall lanterns and position indicators, resistant white back-printed glass, no screws required for mounting. Provide stainless steel cover plates for Firefighter's Phase I switch and hoistway access switches, with tamper resistant screws in same finish.
- I. Mounting: Mount hall fixtures in entrance frames.

## 2.10 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Verify hoistway is clear and plumb, with variations not to exceed -0 to +1 inch at any point. Verify projections greater than 4" must be beveled not less than 75 degrees from horizontal. No negative tolerance is permitted for minimum hoistway dimensions.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

### 3.02 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.



1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
  2. Comply with the National Electrical Code for electrical work required during installation.
- B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- C. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing. Verify hoistway is clear and plumb, with variations not to exceed -0 to +1 inch at any point. Verify projections greater than 4" must be beveled not less than 75 degrees from horizontal. No negative tolerance is permitted for minimum hoistway dimensions.
- D. Lubricate operating parts of systems as recommended by manufacturers.
- E. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.
- F. Set sills flush with finished floor surface at landing. Fill space under sill solidly with non-shrink, nonmetallic grout.
- G. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
1. Place hall lanterns either above or beside each hoistway entrance.
  2. Mount hall lanterns at a minimum of 72 inches above finished floor.

### 3.03 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

### 3.04 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.
- B. Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- C. Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.
- D. Adjust automatic floor leveling feature at each floor to within 1/4 inch of landing.

### 3.05 PROTECTION

- A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for elevator used for construction purposes:
1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
  2. Provide strippable protective film on entrance and car doors and frames.
  3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.

4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
  5. Do not load elevators beyond their rated weight capacity.
  6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
  7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- B. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

### 3.06 DEMONSTRATION

- A. Instruct Owner's personnel in proper use, operations, adjustments, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions, adjusting and maintaining.
- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.
- C. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

### 3.07 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoist way. Remove trash and debris.

### 3.08 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance during normal working hours.
  2. Perform emergency callback service during normal working hours with response time of two hours or less.
  3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

**END OF SECTION 142100.11**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Buried piping.
- C. Escutcheons.
- D. Mechanical couplings.
- E. Pipe hangers and supports.
- F. Pipe sleeves.
- G. Pipe sleeve-seal systems.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099123 - Interior Painting: Preparation and painting of interior fire protection piping systems.
- C. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- D. Section 210553 - Identification for Fire Suppression Piping and Equipment: Piping identification.
- E. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

## 1.03 REFERENCE STANDARDS

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- B. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.
- F. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- G. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.
- H. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2016 (Errata 2017).
- I. ASME B16.25 - Buttwelding Ends; 2017.
- J. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2018.

- K. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- L. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- M. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- N. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2019)e1.
- O. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
- P. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- Q. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- R. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- S. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- U. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- V. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- W. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).
- X. AWWA C606 - Grooved and Shouldered Joints; 2015.
- Y. FM (AG) - FM Approval Guide; current edition.
- Z. ITS (DIR) - Directory of Listed Products; current edition.
- AA. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- AB. UL (DIR) - Online Certifications Directory; Current Edition.
- AC. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

- B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
  - 1. Minimum three years experience.
- C. Comply with FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey requirements.
- D. Valves: Bear FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
  - 1. Comply with NFPA 13.
  - 2. See Section 211300.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

#### 2.02 BURIED PIPING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 or ASTM A795/A795M Standard Weight, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
  - 1. Steel Fittings: ASME B16.9, wrought steel, butt welded, ASME B16.25, butt weld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.
  - 2. Joints: Welded in accordance with AWS D1.1/D1.1M.

#### 2.03 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 40, black.
  - 1. Steel Fittings: ASME B16.5, steel flanges and fittings.
  - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
  - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

#### 2.04 PIPE SLEEVES

- A. Vertical Piping:
  1. Sleeve Length: 1 inch (25 mm) above finished floor.
  2. Provide sealant for watertight joint.
  3. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  1. Zinc-coated or cast-iron pipe.
  2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Clearances:
  1. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
  2. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

#### 2.05 PIPE SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
  1. Advance Products & Systems, Inc; \_\_\_\_\_: [www.apsonline.com/#sle](http://www.apsonline.com/#sle).
  2. GPT, a company of Enpro Industries, Inc; \_\_\_\_\_: [www.gptindustries.com/#sle](http://www.gptindustries.com/#sle).
  3. Substitutions: See Section 016000 - Product Requirements.
- B. Modular Mechanical Seals:
  1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
  2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
  3. Size and select seal component materials in accordance with service requirements.
  4. Service Requirements:
    - a. Underground, buried, and wet conditions.
    - b. Fire Resistance: 1 hour, UL (DIR) approved.
  5. Glass-reinforced plastic pressure end plates.
- C. Wall Sleeve: PVC material with waterstop collar, and nailer end caps.
- D. Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch (76.2 mm) thick.
- E. Pipeline-Casing Seals:
  1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

#### 2.06 ESCUTCHEONS

- A. Manufacturers:
  1. Fire Protection Products, Inc; \_\_\_\_\_: [www.fppi.com/#sle.com/#sle](http://www.fppi.com/#sle.com/#sle).
  2. Tyco Fire Protection Products; \_\_\_\_\_: [www.tyco-fire.com/#sle](http://www.tyco-fire.com/#sle).
  3. Viking Group Inc; \_\_\_\_\_: [www.vikinggroupinc.com/#sle](http://www.vikinggroupinc.com/#sle).

4. Substitutions: See Section 016000 - Product Requirements.
- B. Material:
  1. Metals and Finish: Comply with ASME A112.18.1.
- C. Construction:
  1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
  2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

## 2.07 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.
  1. Manufacturers:
    - a. AFCON, a brand of Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
    - b. FNW; \_\_\_\_\_: [www.fnw.com/#sle](http://www.fnw.com/#sle).
    - c. Substitutions: See Section 016000 - Product Requirements.
- B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.
  1. Manufacturers:
    - a. AFCON, a brand of Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
    - b. FNW; \_\_\_\_\_: [www.fnw.com/#sle](http://www.fnw.com/#sle).
    - c. Substitutions: See Section 016000 - Product Requirements.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Seismic Hangers and Couplings:
  1. Provide resettable and reusable, break away couplings.

## 2.08 MECHANICAL COUPLINGS

- A. Manufacturers:
  1. Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  2. Shurjoint Piping Products, Inc; \_\_\_\_\_: [www.shurjoint.com/#sle](http://www.shurjoint.com/#sle).
  3. Tyco Fire Protection Products; \_\_\_\_\_: [www.tyco-fire.com/#sle](http://www.tyco-fire.com/#sle).
  4. Victaulic Company; FireLock Style 009H: [www.victaulic.com/#sle](http://www.victaulic.com/#sle).
  5. Substitutions: See Section 016000 - Product Requirements.
- B. Rigid Mechanical Couplings for Grooved Joints:
  1. Dimensions and Testing: Comply with AWWA C606.
  2. Minimum Working Pressure: 300 psig (2065 kPa).
  3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
  4. Housing Coating: Factory applied orange enamel.
  5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
  6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.



## PART 3 EXECUTION

## 3.01 PREPARATION

- A. Remove scale and foreign material, from inside and outside, before assembly.
- B. Prepare piping connections to equipment with flanges or unions.

## 3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
  - 1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
  - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  - 2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
  - 3. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
- J. Manufactured Sleeve-Seal Systems:
  - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

K. Escutcheons:

1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

### 3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**END OF SECTION 210500**

## SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING **H2M**

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Two-piece ball valves with indicators.
- B. Check valves.
- C. Iron OS&Y gate valves.
- D. Trim and drain valves.

#### 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 210500 - Common Work Results for Fire Suppression: Pipe and fittings.
- C. Section 210548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.
- D. Section 210553 - Identification for Fire Suppression Piping and Equipment.
- E. Section 211300 - Fire-Suppression Sprinkler Systems.
- F. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

#### 1.03 ABBREVIATIONS AND ACRONYMS

- A. EPDM: Ethylene-propylene diene monomer.
- B. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- C. NRS: Non-rising stem.
- D. OS&Y: Outside screw and yoke.
- E. PTFE: Polytetrafluoroethylene.
- F. SBR: Styrene-butadiene rubber.

#### 1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B31.9 - Building Services Piping; 2017.
- D. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- E. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS; 2017.
- F. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2015.

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- G. AWWA C606 - Grooved and Shouldered Joints; 2015.
- H. FM (AG) - FM Approval Guide; current edition.
- I. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL (DIR) - Online Certifications Directory; Current Edition.
- K. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- L. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- M. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors and maintain at higher than ambient dew point temperature.
    - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
  - 1. Use sling to handle large valves, rigged to avoid damage to exposed parts.

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**H2M**

2. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
  1. Main Level: HAMV - Fire Main Equipment.
    - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
    - b. Level 1: HLOT - Valves.
    - c. Level 3: HLUG - Ball Valves, System Control.
    - d. Level 3: HMER - Check Valves.
    - e. Level 3: HMRZ - Gate Valves.
  2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
    - a. Level 1: VQGU - Valves, Trim, and Drain.
- B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
  1. Automated Sprinkler Systems:
    - a. Indicator posts.
    - b. Valves:
      - 1) Gate valves.
      - 2) Single check valves.
      - 3) Miscellaneous valves.
- C. ASME Compliance:
  1. ASME B16.1 for flanges on iron valves.
  2. ASME B1.20.1 for threads on threaded-end valves.
  3. ASME B31.9 for building services piping valves.
- D. Comply with AWWA C606 for grooved-end connections.
- E. Comply with NFPA 13 for valves.
- F. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.02 TWO-PIECE BALL VALVES WITH INDICATORS

- A. Manufacturers:
  1. FNW; \_\_\_\_\_: [www.fnw.com/#sle](http://www.fnw.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. UL 1091, except with ball instead of disc and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 1112.
- C. Description:
  1. Minimum Pressure Rating: 175 psig (1200 kPa).
  2. Body Design: Two piece.
  3. Body Material: Forged brass or bronze.
  4. Port Size: Full or standard.
  5. Seat: PTFE.
  6. Stem: Bronze or stainless steel.
  7. Ball: Chrome-plated brass.

## SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING **H2M**

8. Actuator: Worm gear or traveling nut.

### 2.03 CHECK VALVES

- A. Manufacturers:
  1. FNW; \_\_\_\_\_: [www.fnw.com/#sle](http://www.fnw.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.
- C. AWWA C508 compliant check valves.
- D. Minimum Pressure Rating: 175 psig (1200 kPa).
- E. Type: Center guided check valve.
- F. Body Material: Cast iron, ductile iron.
- G. Center guided check with elastomeric seal.
- H. Hinge Spring: Stainless steel.
- I. End Connections: Flanged, grooved, or threaded.

### 2.04 IRON OS&Y GATE VALVES

- A. Manufacturers:
  1. FNW; 751 Series: [www.fnw.com/#sle](http://www.fnw.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Listed and Body Marked: AWWA C509, FM (AG), and UL 262.
- C. Maximum Working Pressure: 175 psi (1,200 kPa).
- D. Body and Bonnet Material: Cast or ductile iron.
- E. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
- F. Stem: Brass, bronze, or stainless steel.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.

### 2.05 TRIM AND DRAIN VALVES

- A. Ball Valves:
  1. Description:
    - a. Pressure Rating: 175 psig (1200 kPa).
    - b. Body Design: Two piece.
    - c. Body Material: Forged brass or bronze.
    - d. Port Size: Full or standard.
    - e. Seat: PTFE.
    - f. Stem: Bronze or stainless steel.
    - g. Ball: Chrome-plated brass.
    - h. Actuator: Hand-lever.

SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING  
**H2M**

PART 3 EXECUTION

3.01 EXAMINATION

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.

3.02 INSTALLATION

- A. Comply with specific valve installation requirements and application in the following Sections:
  - 1. Section 211300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
- C. Valves in horizontal piping installed with stem at or above the pipe center.
- D. Position valves to allow full stem movement.
- E. Install valve tags. Comply with Section 210553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

**END OF SECTION 210523**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.
- E. Ceiling tacks.

## 1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

## 1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

## PART 2 PRODUCTS

## 2.01 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags.
- B. Control Panels: Nameplates.
- C. Instrumentation: Tags.
- D. Major Control Components: Nameplates.
- E. Piping: Tags.
- F. Small-sized Equipment: Tags.
- G. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

## 2.02 NAMEPLATES

- A. Manufacturers:
  - 1. Brimar Industries, Inc; \_\_\_\_\_: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 2. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).



3. Seton Identification Products, a Tricor Direct Company; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
1. Letter Color: White.
  2. Letter Height: 1/4 inch (6 mm).
  3. Background Color: Black.
  4. Thickness: 1/8 inch (3 mm).
  5. Plastic: Comply with ASTM D709.

### 2.03 TAGS

- A. Manufacturers:
1. Advanced Graphic Engraving, LLC; \_\_\_\_\_: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).
  2. Brady Corporation; \_\_\_\_\_: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  3. Brimar Industries, Inc; \_\_\_\_\_: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  4. Craftmark Pipe Markers; \_\_\_\_\_: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  5. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  6. Seton Identification Products, a Tricor Direct Company; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  7. Substitutions: See Section 016000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

### 2.04 STENCILS

- A. Manufacturers:
1. Brady Corporation; \_\_\_\_\_: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Craftmark Pipe Markers; \_\_\_\_\_: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  3. Insite Solutions, LLC; \_\_\_\_\_: [www.stop-painting.com/#sle](http://www.stop-painting.com/#sle).
  4. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products, a Tricor Direct Company; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  6. \_\_\_\_\_.
- B. Stencils: With clean cut symbols and letters of following size:
1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
  2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
  3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
  4. Equipment: 2-1/2 inch (65 mm) high letters.

### 2.05 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation; \_\_\_\_\_: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Brimar Industries, Inc; \_\_\_\_\_: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  3. Craftmark Pipe Markers; \_\_\_\_\_: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  4. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products, a Tricor Company; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.

- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.
- E. Color code as follows:
  - 1. Fire Quenching Fluids: Red with white letters.

## 2.06 CEILING TACKS

- A. Manufacturers:
  - 1. Craftmark Pipe Markers; \_\_\_\_\_: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### 3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 099123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

## END OF SECTION 210553

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Dry-pipe sprinkler system.
- C. System design, installation, and certification.
- D. Fire department connections.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 210500 - Common Work Results for Fire Suppression: Pipe and fittings.
- C. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- D. Section 210548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.
- E. Section 210553 - Identification for Fire Suppression Piping and Equipment.

## 1.03 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; current edition.
- B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.
- C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.
- D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
- F. ITS (DIR) - Directory of Listed Products; current edition.
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 1963 - Standard for Fire Hose Connections; 2019.
- I. UL (DIR) - Online Certifications Directory; Current Edition.
- J. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

## 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

- C. Shop Drawings:
  - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
  - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
  - 3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect/Engineer.
- D. Installer's qualification statement.
- E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
  - 3. Sprinkler Wrenches: For each sprinkler type.
- G. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

#### 1.05 QUALITY ASSURANCE

- A. Comply with FM (AG) requirements.
- B. Equipment and Components: Provide products that bear UL (DIR) label or marking.
- C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
  - 1. Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  - 2. Tyco Fire Protection Products; \_\_\_\_\_: [www.tyco-fire.com/#sle](http://www.tyco-fire.com/#sle).
  - 3. Viking Corporation; \_\_\_\_\_: [www.vikinggroupinc.com/#sle](http://www.vikinggroupinc.com/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.

#### 2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light Hazard, Ordinary Hazard - Group 1, Ordinary Hazard - Group 2; comply with NFPA 13
- C. Water Supply: Determine volume and pressure from water flow test data.

- D. Provide fire department connections where indicated.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- F. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
  - 6. Other Types: As required.

### 2.03 SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Finish: Brass.
  - 4. Cover Plate Finish: White.
  - 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Upright type.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Finish: Brass.
  - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard, Extended.
  - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- D. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Finish: Brass.
  - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

### 2.04 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
  - 1. Activate electric alarm.
  - 2. Test and drain valve.
  - 3. Replaceable internal components without removing valve from installed position.
  - 4. Manufacturers:
    - a. Victaulic Company; Series 751 with Series 760 motor alarm: [www.victaulic.com/#sle](http://www.victaulic.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
- B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:

1. Activate electric alarm.
  2. Test and drain valve.
  3. Externally resettable.
  4. Replaceable internal components without removing valve from installed position.
  5. Manufacturers:
    - a. Victaulic Company; Series 768 - NXT: [www.victaulic.com/#sle](http://www.victaulic.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
- C. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- D. Test Connections:
1. Inspector's Test Connection for Preaction Systems:
    - a. Provide test connections approximately 6 ft (2 m) above floor for each sprinkler system equipped with an alarm device, located at the most remote part of each system.
    - b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
    - c. Supply discharge orifice with same size as corresponding sprinkler orifice.
    - d. Limit vertical height of exterior wall penetration to 2 ft (0.61 m) above finished grade.
- E. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.
- F. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- G. Fire Department Connections:
1. Type: Exposed, projected wall mount made of corrosion resistant metal complying with UL 405.
    - a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.

## 2.05 AIR COMPRESSOR

- A. Compressor: Single-unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Locate outside alarm gong on building wall as indicated.
- D. Place pipe runs to minimize obstruction to other work.
- E. Place piping in concealed spaces above finished ceilings.
- F. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

- G. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- H. Install air compressor on vibration isolators. Refer to Section 210548.
- I. Flush entire piping system of foreign matter.
- J. Hydrostatically test entire system.
- K. Require test be witnessed by Fire Marshal.

**END OF SECTION 211300**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Flexible pipe connectors.

## 1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.

## 1.03 REFERENCE STANDARDS

- A. EJMA (STDS) - EJMA Standards; Tenth Edition.
- B. FM (AG) - FM Approval Guide; current edition.
- C. ITS (DIR) - Directory of Listed Products; current edition.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

## 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
  - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
- C. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.
- D. Maintenance Data: Include adjustment instructions.
- E. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Packing for Packed Expansion Joints: One set for each joint.

## PART 2 PRODUCTS

## 2.01 REGULATORY REQUIREMENTS

- A. Comply with UL (DIR) requirements.

## 2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Manufacturers:
  - 1. Mercer Rubber Company; \_\_\_\_\_: [www.mercer-rubber.com/#sle](http://www.mercer-rubber.com/#sle).
  - 2. The Metraflex Company; \_\_\_\_\_: [www.metraflex.com/#sle](http://www.metraflex.com/#sle).
  - 3. Substitutions: See Section 016000 - Product Requirements.



- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Braided bronze.
- D. Pressure Rating: \_\_\_\_ psi up to \_\_\_\_ inch (\_\_\_\_ kPa up to \_\_\_\_ mm, DN).
- E. End Connections: Flanged.
- F. Size: Use pipe sized units.
- G. Application: Copper piping.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

**END OF SECTION 220516**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099113 - Exterior Painting: Preparation and painting of exterior piping systems.
- C. Section 099123 - Interior Painting: Preparation and painting of interior piping systems.
- D. Section 220523 - General-Duty Valves for Plumbing Piping.
- E. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- F. Section 220719 - Plumbing Piping Insulation.

## 1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

## 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Valve Stem Packings: Two for each type and size of valve.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
  - 1. Minimum three years experience.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 PIPE SLEEVES

- A. Manufacturers:
  - 1. Flexicraft Industries; Pipe Wall Sleeve: [www.flexicraft.com/#sle](http://www.flexicraft.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

### 2.02 PIPE-SLEEVE SEALS

- A. Manufacturers:
  - 1. Advance Products & Systems, LLC; Innerlynx: [www.apsonline.com/#sle](http://www.apsonline.com/#sle).
  - 2. Flexicraft Industries; PipeSeal: [www.flexicraft.com/#sle](http://www.flexicraft.com/#sle).
  - 3. Substitutions: See Section 016000 - Product Requirements.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

### 3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  - 2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
  - 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
  - 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- E. Manufactured Sleeve-Seal Systems:
  - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  - 3. Locate piping in center of sleeve or penetration.
  - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  - 5. Tighten bolting for a water-tight seal.
  - 6. Install in accordance with manufacturer's recommendations.
- F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### 3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**END OF SECTION 220517**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Ball valves.
- B. Butterfly valves.
- C. Check valves.
- D. Gate valves.
- E. Globe valves.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 220553 - Identification for Plumbing Piping and Equipment.
- C. Section 220719 - Plumbing Piping Insulation.
- D. Section 221005 - Plumbing Piping.
- E. Section 221500 - General-Service Compressed-Air Systems.

## 1.03 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

## 1.04 REFERENCE STANDARDS

- A. API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding; 2017.
- B. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.

- E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- G. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.
- H. ASME B31.9 - Building Services Piping; 2017.
- I. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- J. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- K. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2019).
- L. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2018).
- M. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2019)e1.
- N. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- O. AWWA C606 - Grooved and Shouldered Joints; 2015.
- P. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
- Q. MSS SP-67 - Butterfly Valves; 2017.
- R. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.
- S. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- T. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
- U. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- V. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- W. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- X. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- Y. MSS SP-125 - Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves; 2018.
- Z. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- AA. NSF 372 - Drinking Water System Components - Lead Content; 2016.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
  - 1. See Section 016000 - Product Requirements for additional provisions.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
  - 2. Protect valve parts exposed to piped medium against rust and corrosion.
  - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
  - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
  - 5. Secure check valves in either the closed position or open position.
  - 6. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors in dry environment.

#### 1.08 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:

- A. Handle large valves with sling, modified to avoid damage to exposed parts.
- B. Avoid the use of operating handles or stems as rigging or lifting points.

### PART 2 PRODUCTS

#### 2.01 APPLICATIONS

- A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- B. Provide the following valves for the applications if not indicated on drawings:
  - 1. Shutoff: Ball, butterfly, gate or plug.
  - 2. Throttling: Provide globe, ball, or butterfly.

- C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- D. Low Pressure, Compressed Air Valves 150 psi (1,035 kPa) or Less:
  - 1. 2 inch (50 mm, DN) and Smaller:
    - a. Bronze: Provide with solder-joint ends.
    - b. Ball: One piece, full port, brass with brass trim.
- E. High Pressure, Compressed Air Valves 150 psi (1,035 kPa) to 200 psi (1,380 kPa):
  - 1. 2 inch (50 mm, DN) and Smaller:
    - a. Bronze: Provide with solder-joint ends.
    - b. Ball: One piece, full port, brass with brass trim.
- F. Domestic, Hot and Cold Water Valves:
  - 1. 2 inch (50 mm, DN) and Smaller:
    - a. Bronze: Provide with solder-joint ends.
    - b. Ball: One piece, full port, brass with brass trim.
    - c. Bronze Gate: Class 125, NRS.
    - d. Bronze Globe: Class 125, bronze disc.

## 2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
  - 1. Gear Actuator: Quarter-turn valves 8 inch (200 mm, DN) and larger.
  - 2. Handwheel: Valves other than quarter-turn types.
  - 3. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.
  - 4. Wrench: Plug valves with square heads.
- D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
  - 1. Gate Valves: Rising stem.
  - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
  - 3. Butterfly Valves: Extended neck.
- E. Valve-End Connections:
  - 1. Threaded End Valves: ASME B1.20.1.
  - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
  - 3. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
  - 4. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
  - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
  - 2. Solder-joint Connections: ASME B16.18.
  - 3. Building Services Piping Valves: ASME B31.9.
- G. Potable Water Use:
  - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.



2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Valve Bypass and Drain Connections: MSS SP-45.

### 2.03 BRASS, BALL VALVES

- A. Two Piece, Full Port with Brass Trim and Female Thread, Male thread, or Solder Connections:
  1. Comply with MSS SP-110.
  2. WSP Rating: 150 psi (1,035 kPa).
  3. WOG Rating: 600 psi (4,140 kPa).
  4. Body: Forged brass.
  5. Seats: PTFE.
  6. Ball: Chrome-plated brass.
  7. Operator: Lockable handle and memory stop.
  8. Manufacturers:
    - a. Apollo Valves; \_\_\_\_\_: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
    - b. FNW; 410A: [www.fnw.com/#sle](http://www.fnw.com/#sle).
    - c. Jomar Valves, a division of Jomar Group; \_\_\_\_\_: [www.jomarvalve.com/#sle](http://www.jomarvalve.com/#sle).
    - d. Substitutions: See Section 016000 - Product Requirements.

### 2.04 BRONZE, BALL VALVES

- A. General:
  1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. One Piece, Reduced Port with Bronze Trim:
  1. Comply with MSS SP-110.
  2. WSP Rating: 400 psi (2,760 kPa).
  3. CWP Rating: 600 psi (4,140 kPa).
  4. Body: Bronze.
  5. End Connections: Pipe press.
  6. Seats: PTFE.
  7. Stem: Bronze.
  8. Ball: Chrome plated brass.
  9. Manufacturers:
    - a. Viega LLC; \_\_\_\_\_: [www.viega.us/#sle](http://www.viega.us/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
- C. Two Piece, Full Port with Bronze Trim:
  1. Comply with MSS SP-110.
  2. WSP Rating: 150 psi (1,035 kPa).
  3. WOG Rating: 600 psi (4,140 kPa).
  4. Body: Forged bronze or dezincified-brass alloy.
  5. Ends Connections: Pipe thread or solder.
  6. Seats: PTFE.
  7. Stem: Bronze, blowout proof.
  8. Ball: Chrome plated brass.
  9. Manufacturers:
    - a. Apollo Valves; \_\_\_\_\_: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
    - b. Viega LLC; \_\_\_\_\_: [www.viega.us/#sle](http://www.viega.us/#sle).
    - c. Substitutions: See Section 016000 - Product Requirements.

## 2.05 BRONZE, GATE VALVES

- A. General:
  - 1. Fabricate from dezincification resistant material.
  - 2. Copper alloys containing more than 15 percent zinc are not permitted.

## 2.06 BRONZE, GLOBE VALVES

- A. General:
  - 1. Fabricate from dezincification resistant material.
  - 2. Copper alloys containing more than 15 percent zinc are not permitted.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

## 3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

**END OF SECTION 220523**

**PART 1 GENERAL****1.01 SECTION INCLUDES****1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 055000 - Metal Fabrications.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- G. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- K. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  5. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Installer's Qualifications: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### 1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Installer Qualifications for Field-Welding: As specified in Section 055000.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 055000.
1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
  2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
  - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

#### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION 220529**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Constant wattage resistance electric heating cable.
- B. Cable outer jacket markings.
- C. Connection kits.

## 1.02 RELATED REQUIREMENTS

- A. Section 220553 - Identification for Plumbing Piping and Equipment
- B. Section 220719 - Plumbing Piping Insulation.
- C. Section 221005 - Plumbing Piping.
- D. Section 221006 - Plumbing Piping Specialties.
- E. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- F. Section 260526 - Grounding and Bonding for Electrical Systems.
- G. Section 260533.13 - Conduit for Electrical Systems.
- H. Section 260583 - Wiring Connections.

## 1.03 REFERENCE STANDARDS

- A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2012.
- B. ITS (DIR) - Directory of Listed Products; current edition.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
- B. Coordinate the work with other trades to provide ground fault protection for electric heat tracing circuits as required by NFPA 70.
- C. Coordinate the work with other trades to provide circuit breaker ratings suitable for installed circuit lengths.

## 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for electric heat tracing.

- C. Shop Drawings: Indicate electric heat tracing layout, electrical terminations, thermostats, controls, and branch circuit connections.
- D. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.
- E. Field Quality Control Submittals: Indicate test reports and inspection reports.
- F. Project Record Documents: Record actual locations of electric heat tracing lines and thermostats.
- G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.
- H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

#### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

### PART 2 PRODUCTS

#### 2.01 CONSTANT WATTAGE RESISTANCE ELECTRIC HEATING CABLE

- A. Manufacturers:
  - 1. Chromalox, Inc; Chromalox-30: [www.chromalox.com/#sle](http://www.chromalox.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).

#### 2.02 CABLE OUTER JACKET MARKINGS

- A. Name of manufacturer, trademark, or other recognized symbol of identification.
- B. Catalog number, reference number, or model.
- C. Month and year of manufacture, date coding, applicable serial number, or equivalent.
- D. Agency listing or approval.

#### 2.03 CONNECTION KITS

- A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.



- B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that piping and equipment are ready to receive work.
- B. Verify field measurements are as indicated on shop drawings.
- C. Verify required power is available, in proper location, and ready for use.

### 3.02 PREPARATION

- A. Clean exposed surfaces prior to installation.
- B. Prepare surfaces using approved methods as recommended by manufacturer.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's written installation instructions.
- B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.
- C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.
- D. Comply with applicable local building codes and requirements of authorities having jurisdiction.
- E. Identification:
  - 1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft (6 m) including cladding over each valve or other equipment that may require maintenance.

### 3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Perform start-up by factory technician or factory representative as per Owner's requirements.
- C. Field Testing and Inspections:
  - 1. Commission system in accordance with installation and operation manual.
  - 2. Inspect for sources of water entry and proper sealing.
  - 3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
  - 4. Insulation Resistance: Greater than 20 megohms at a test voltage of 2500 VDC for polymer insulated trace heaters.
  - 5. Test heating cable integrity with megohmmeter at the following intervals:
    - a. Prior to initial start-up (commissioning).
  - 6. Measure voltage and current at each unit.
  - 7. Controls:
    - a. Verify control parameters are set to the application requirements.

### 3.05 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

**END OF SECTION 220533**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Tags.
- B. Stencils.
- C. Pipe markers.

## 1.02 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Identification painting.

## 1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

## 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Schedules:
  - 1. Submit plumbing component identification schedule listing equipment, piping, and valves.
  - 2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
  - 3. Valve Data Format: Include id-number, location, function, and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

## PART 2 PRODUCTS

## 2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

## 2.02 NAMEPLATES

- A. Manufacturers:
  - 1. Brimar Industries, Inc; \_\_\_\_\_: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 2. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 3. Seton Identification Products; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Laminated piece with up to three lines of text.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch (6 mm).
  - 3. Background Color: Black.

## 2.03 TAGS

- A. Manufacturers:

1. Advanced Graphic Engraving; \_\_\_\_\_: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).
  2. Brady Corporation; \_\_\_\_\_: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  3. Brimar Industries, Inc; \_\_\_\_\_: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  4. Craftmark Pipe Markers; \_\_\_\_\_: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  5. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  6. Seton Identification Products; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  7. Substitutions: See Section 016000 - Product Requirements.
- B. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.
- C. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

#### 2.04 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation; \_\_\_\_\_: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Brimar Industries, Inc; \_\_\_\_\_: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  3. Craftmark Pipe Markers; \_\_\_\_\_: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  4. Kolbi Pipe Marker Co; \_\_\_\_\_: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products; \_\_\_\_\_: [www.seton.com/#sle](http://www.seton.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- D. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.
- E. Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
  2. Secondary: Color scheme per fluid service.
    - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

#### 3.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 220553**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Glass fiber insulation.
- B. Jacketing and accessories.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099113 - Exterior Painting: Painting insulation jacket.
- C. Section 099123 - Interior Painting: Painting insulation jacket.
- D. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

## 1.03 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).
- D. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).
- E. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- F. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017.
- G. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020a.
- H. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.
- I. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).
- J. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- K. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.
- L. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010 (Reapproved 2016).
- M. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2021.

- N. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 2017.
- O. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- P. ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation; 2017.
- Q. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service; 2020.
- R. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber; 2020.
- S. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.
- T. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- U. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- V. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- W. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- X. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

#### 1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## PART 2 PRODUCTS

## 2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

## 2.02 GLASS FIBER INSULATION

- A. Manufacturers:
1. CertainTeed Corporation; \_\_\_\_\_: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  2. Johns Manville Corporation; \_\_\_\_\_: [www.jm.com/#sle](http://www.jm.com/#sle).
  3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
  5. Owens Corning Corporation; VaporWick Pipe Insulation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  2. Maximum Service Temperature: 850 degrees F (454 degrees C).
  3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
  2. Maximum Service Temperature: 220 degrees F (104 degrees C).
  3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  2. Maximum Service Temperature: 650 degrees F (343 degrees C).
  3. Maximum Moisture Absorption: 0.2 percent by volume.
- E. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).
- F. Vapor Barrier Lap Adhesive: Compatible with insulation.
- G. Fibrous Glass Fabric:

## 2.03 JACKETING AND ACCESSORIES

- A. PVC Plastic Jacket:
1. Manufacturers:
    - a. Johns Manville Corporation; \_\_\_\_\_: [www.jm.com/#sle](http://www.jm.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
    - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
    - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.



- d. Thickness: 10 mil, 0.010 inch (0.25 mm).
- e. Connections: Brush on welding adhesive.
- 3. Covering Adhesive Mastic: Compatible with insulation.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.
- J. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

- K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

**END OF SECTION 220719**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet (1500 mm) of building.
- D. Domestic water piping, above grade.
- E. Storm drainage piping, buried within 5 feet (1500 mm) of building.
  - 1. Storm drainage piping, above grade.
  - 2. Natural gas piping, buried beyond 5 feet (1500 mm) of building.
  - 3. Natural gas piping, buried within 5 feet (1500 mm) of building.
  - 4. Natural gas piping, above grade.
  - 5. Pipe flanges, unions, and couplings.
  - 6. Pipe hangers and supports.
  - 7. Pipe sleeve-seal systems.
  - 8. Ball valves.
  - 9. Butterfly valves.
  - 10. Balancing valves.
  - 11. Strainers.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 099113 - Exterior Painting.
- D. Section 099123 - Interior Painting.
- E. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- F. Section 220553 - Identification for Plumbing Piping and Equipment.
- G. Section 220719 - Plumbing Piping Insulation.
- H. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.
- I. Section 312316 - Excavation.
- J. Section 312323 - Fill.
- K. Section 330110.58 - Disinfection of Water Utility Piping Systems.

## 1.03 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 2015.
- B. ANSI Z223.1 - National Fuel Gas Code; 2016.

- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- H. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2016.
- I. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
- J. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2017.
- K. ASME B31.1 - Power Piping; 2018.
- L. ASME B31.9 - Building Services Piping; 2017.
- M. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2019.
- N. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- O. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.
- P. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- Q. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- R. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.
- S. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- T. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- U. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).
- V. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- W. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a.
- X. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 2015.
- Y. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2011.

- Z. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2011.
- AA. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- AB. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; 2017.
- AC. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
- AD. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- AE. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- AF. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2015a.
- AG. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, Culvert Pipe and (Metric); 2015a.
- AH. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2019b.
- AI. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2019b.
- AJ. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2018).
- AK. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012 (Reapproved 2017).
- AL. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011 (Reapproved 2017).
- AM. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- AN. ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications; 2000 (Reapproved 2015).
- AO. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- AP. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.
- AQ. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.
- AR. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).
- AS. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

- AT. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.
- AU. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- AV. ASTM D2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2017.
- AW. ASTM D2997 - Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2015.
- AX. ASTM D3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe; 2016.
- AY. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe; 2019.
- AZ. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe; 2019.
- BA. ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications; 2019.
- BB. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- BC. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- BD. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- BE. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- BF. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- BG. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).
- BH. AWWA C651 - Disinfecting Water Mains; 2014.
- BI. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.
- BJ. AWWA C950 - Fiberglass Pressure Pipe; 2013.
- BK. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2017 (Revised 2018).
- BL. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2012 (Revised 2018).
- BM. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- BN. MSS SP-67 - Butterfly Valves; 2017.

- BO. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.
- BP. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- BQ. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- BR. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- BS. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- BT. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- BU. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- BV. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- D. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.
- E. Sustainable Design Documentation: For products meeting regulatory lead-content restrictions.
- F. Project Record Documents: Record actual locations of valves.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Valve Repacking Kits: One for each type and size of valve.

#### 1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### 1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

#### 2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

#### 2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2729.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### 2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.



## 2.05 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
  - 3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
    - a. Manufacturers:
      - 1) Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
      - 2) Apollo Valves; \_\_\_\_\_: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
      - 3) Grinnell Products; \_\_\_\_\_: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
      - 4) Viega LLC; \_\_\_\_\_: [www.viega.us/#sle](http://www.viega.us/#sle).
      - 5) Substitutions: See Section 016000 - Product Requirements.

## 2.06 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

## 2.07 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
  - 1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
  - 2. Joints: ASME B31.1, welded.

## 2.08 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

## 2.09 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: Threaded or welded to ASME B31.1.

## 2.10 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
  - 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):
  - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.11 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
  2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
  4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
  5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
  3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.
  4. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.

## 2.12 PIPE SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
1. The Metraflex Company; MetraSeal: [www.metraflex.com/#sle](http://www.metraflex.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Modular Mechanical Seals:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
  2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
  3. Size and select seal component materials in accordance to service requirements.
  4. Glass reinforced plastic pressure end plates.

## 2.13 BALL VALVES

- A. Manufacturers:
1. Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  2. Apollo Valves; \_\_\_\_\_: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  3. Grinnell Products; \_\_\_\_\_: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
  4. Nibco, Inc; \_\_\_\_\_: [www.nibco.com/#sle](http://www.nibco.com/#sle).
  5. SharkBite, a brand of Reliance Worldwide Corporation; \_\_\_\_\_: [www.sharkbite.com/#sle](http://www.sharkbite.com/#sle).
  6. Uponor, Inc; \_\_\_\_\_: [www.uponorengineering.com/#sle](http://www.uponorengineering.com/#sle).
  7. Viega LLC; \_\_\_\_\_: [www.viega.us/#sle](http://www.viega.us/#sle).
  8. Substitutions: See Section 016000 - Product Requirements.
- B. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

## 2.14 BUTTERFLY VALVES

- A. Manufacturers:
  - 1. Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  - 2. Apollo Valves; \_\_\_\_\_: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  - 3. Crane Company; \_\_\_\_\_: [www.cranecpe.com/#sle](http://www.cranecpe.com/#sle).
  - 4. Flomatic Valves; \_\_\_\_\_: [www.flomatic.com/#sle](http://www.flomatic.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Construction 1-1/2 inch (40 mm, DN) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 8 inches (150 mm, DN) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

## 2.15 BALANCING VALVES

- A. Manufacturers:
  - 1. Anvil International; \_\_\_\_\_: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  - 2. ITT Bell & Gossett; \_\_\_\_\_: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  - 3. Jomar Valves, a division of Jomar Group; \_\_\_\_\_: [www.jomarvalve.com/#sle](http://www.jomarvalve.com/#sle).
  - 4. Griswold Controls; \_\_\_\_\_: [www.griswoldcontrols.com/#sle](http://www.griswoldcontrols.com/#sle).
  - 5. Taco, Inc; \_\_\_\_\_: [www.taco-hvac.com/#sle](http://www.taco-hvac.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- C. Manual Operated Y-Pattern Globe, Size 1/2 to 2 inch (15 to 50 mm, DN):
  - 1. Class 125, brass or bronze body, multi-turn handwheel, memory stop, variable orifice, soldered connections, dual PT (hot and cold pressure-temperature) test ports for 300 psi (2,068 kPa), minus 4 to 250 deg F (minus 20 to 121.1 deg C) WOG service.
- D. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

## 2.16 STRAINERS

- A. Manufacturers:
  - 1. Armstrong International, Inc; \_\_\_\_\_: [www.armstronginternational.com/#sle](http://www.armstronginternational.com/#sle).
  - 2. Green Country Filter Manufacturing; \_\_\_\_\_: [www.greencountryfilter.com/#sle](http://www.greencountryfilter.com/#sle).
  - 3. Jomar Valves, a division of Jomar Group; \_\_\_\_\_: [www.jomarvalve.com/#sle](http://www.jomarvalve.com/#sle).
  - 4. WEAMCO; \_\_\_\_\_: [www.weamco.com/#sle](http://www.weamco.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):
  - 1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

## 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

## 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
  - 1. Coordinate size and location of access doors with Section 083100.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- K. Excavate in accordance with Section 312316.
- L. Backfill in accordance with Section 312323.
- M. Install valves with stems upright or horizontal, not inverted. See Section 220523.
- N. Install water piping to ASME B31.9.
- O. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- P. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- Q. Sleeve pipes passing through partitions, walls, and floors.
- R. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
  - 3. Place hangers within 12 inches (300 mm) of each horizontal elbow.

4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  6. Support cast iron drainage piping at every joint.
- S. Pipe Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a watertight seal.
  6. Install in accordance with manufacturer's recommendations.

### 3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.

### 3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

### 3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.

### 3.07 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, and sand strainer.

### END OF SECTION 221005

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Washing machine boxes and valves.
- E. Backflow preventers.
- F. Double check valve assemblies.
- G. Water hammer arrestors.
- H. Sanitary waste interceptors.
- I. Mixing valves.
- J. Floor drain trap seals.
- K. Catch basins and manholes.
- L. Exterior penetration accessories.
- M. Fire-rated enclosures.

## 1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Product requirements for Owner furnished kitchen equipment.
- B. Section 016000 - Product Requirements: Procedures for Owner-supplied products.
- C. Section 033000 - Cast-in-Place Concrete: Manhole bottoms.
- D. Section 033000 - Cast-in-Place Concrete: Execution requirements for concrete catch basin bases.
- E. Section 221005 - Plumbing Piping.
- F. Section 223000 - Plumbing Equipment.
- G. Section 224000 - Plumbing Fixtures.

## 1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.6.3 - Floor and Trench Drains; 2019.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2017.
- D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2009.

- E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
- F. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- G. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.
- H. ASTM C478/C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2020.
- I. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- J. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- K. PDI-WH 201 - Water Hammer Arresters; 2017.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- F. Manufacturer's qualification statement.
- G. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

## 2.02 DRAINS

- A. Manufacturers:
  - 1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - 2. Substitutions: See Section 016000 - Product Requirements.

## 2.03 CLEANOUTS

- A. Manufacturers:
  - 1. Zurn Industries, LLC; \_\_\_\_\_: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Cleanouts at Interior Finished Floor Areas (CO-3):
  - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

## 2.04 HOSE BIBBS

- A. Manufacturers:
  - 1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - 2. Substitutions: See Section 016000 - Product Requirements.

## 2.05 WASHING MACHINE BOXES AND VALVES

- A. Box Manufacturers:
  - 1. Oatey Supply Chain Services, Inc; \_\_\_\_\_: [www.oatey.com/#sle](http://www.oatey.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Valve Manufacturers:
  - 1. Cash Acme, a brand of Reliance Worldwide Corporation; \_\_\_\_\_: [www.cashacme.com/#sle](http://www.cashacme.com/#sle).
  - 2. Zurn Industries, LLC; \_\_\_\_\_: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 3. Substitutions: See Section 016000 - Product Requirements.
- C. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch (50 mm) waste, slip in finishing cover.

## 2.06 BACKFLOW PREVENTERS

- A. Manufacturers:
  - 1. Watts Regulator Company, a part of Watts Water Technologies; \_\_\_\_\_: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Reduced Pressure Backflow Preventer Assembly:
  - 1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
  - 2. Size: 1-1/2 inch (\_\_\_\_\_ mm) assembly with threaded full port ball valves.
  - 3. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.



## 2.07 DOUBLE CHECK-VALVE ASSEMBLIES

- A. Manufacturers:
  - 1. Watts Regulator Company, a part of Watts Water Technologies; \_\_\_\_\_: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Double Check Valve Assembly:
  - 1. ASSE 1012; cast bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.
  - 2. Size: 3/4 to 2 inch, NPS (20 to 50 mm, DN) assembly with threaded full port ball valves.

## 2.08 WATER HAMMER ARRESTORS

- A. Manufacturers:
  - 1. Cash Acme, a brand of Reliance Worldwide Corporation; \_\_\_\_\_: [www.cashacme.com/#sle](http://www.cashacme.com/#sle).
  - 2. Jay R. Smith Manufacturing Company; \_\_\_\_\_: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
  - 3. Watts Regulator Company, a part of Watts Water Technologies; \_\_\_\_\_: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  - 4. Zurn Industries, LLC; \_\_\_\_\_: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Water Hammer Arrestors:
  - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

## 2.09 SANITARY WASTE INTERCEPTORS

- A. Oil Interceptors:
  - 1. Construction:
    - a. Material: Epoxy coated fabricated steel.
    - b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange.
    - c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.
  - 2. Manufacturers:
    - a. See Interceptors Scheule on Sheet P2 003.
    - b. Substitutions: See Section 016000 - Product Requirements.
- B. Grease Interceptors:
  - 1. Construction:
    - a. Material: High-density polyethylene.
    - b. Rough-in: Fully recessed (shallow rough-in) with anchor flange.
    - c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.
  - 2. Manufacturers:
    - a. See Interceptor Schedule on Sheet P2 003.
    - b. Substitutions: See Section 016000 - Product Requirements.

## 2.10 MIXING VALVES

- A. Thermostatic Mixing Valves:
  - 1. Manufacturers:

- a. Substitutions: See Section 016000 - Product Requirements.
2. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

#### 2.11 FLOOR DRAIN TRAP SEALS

- A. Manufacturers:
  1. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

#### 2.12 CATCH BASINS AND MANHOLES

- A. Manufacturers:
  1. Substitutions: See Section 016000 - Product Requirements.

#### 2.13 FIRE-RATED ENCLOSURES

- A. Manufacturers:
  1. Fire Rated Product Specialties Corp; \_\_\_\_\_: [www.frpsonline.com/#sle](http://www.frpsonline.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Provide as required to preserve fire resistance rating of building elements.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- E. Pipe relief from backflow preventer to nearest drain.
- F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks.

#### END OF SECTION 221006

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 220523 - General-Duty Valves for Plumbing Piping.
- C. Section 220553 - Identification for Plumbing Piping and Equipment.

## 1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
- F. ASME B31.1 - Power Piping; 2018.
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2019)e1.
- J. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- L. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).
- M. NSF 372 - Drinking Water System Components - Lead Content; 2016.

## 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions, hoisting and setting requirements, starting procedures.

- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Project Record Documents: Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect piping and equipment from weather and construction traffic.

#### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

### PART 2 PRODUCTS

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Make air cock and drain connection on horizontal casing.
- C. Install line size gate valve and check valve on compressor discharge. See Section 220523.
- D. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.
- E. Identify piping system and components. See Section 220553.

#### 3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.
- C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.
- D. Cap and seal ends of piping when not connected to mechanical equipment.

### END OF SECTION 221500

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Commercial gas-fired water heaters.
- B. Commercial electric water heaters.
- C. Diaphragm-type compression tanks.
- D. In-line circulator pumps.
- E. Submersible sump pumps.

## 1.02 RELATED REQUIREMENTS

- A. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

## 1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.
- C. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2015.
- D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2019.
- F. NEMA MG 1 - Motors and Generators; 2018.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

## 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.

3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tapings, and drains.
- D. Project Record Documents: Record actual locations of components.
- E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Project Record Documents: Record actual locations of components.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements for additional provisions.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Certifications:
1. Water Heaters: NSF approved.
  2. Gas Water Heaters: AHRI Directory of Certified Product Performance.
  3. Electric Water Heaters: UL listed and labeled to UL 174.
  4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

#### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

### PART 2 PRODUCTS

#### 2.01 WATER HEATERS

- A. Manufacturers:
1. A.O. Smith Water Products Co; \_\_\_\_\_: [www.hotwater.com/#sle](http://www.hotwater.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Commercial Gas-Fired Water Heaters:
1. Type: Automatic, natural gas-fired, vertical storage.

2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  3. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
  4. Accessories:
    - a. Water Connections: Brass.
    - b. Dip Tube: Brass.
    - c. Drain valve.
    - d. Anode: Magnesium.
  5. Applications:
    - a. Automatic storage water heater.
  6. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F (49 to 82 degrees C), automatic reset high temperature limiting thermostat factory set at 195 degrees F (90 degrees C), gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.
- C. Commercial Electric Water Heaters:
1. Type: Factory-assembled and wired, electric, vertical storage.
  2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  3. Performance:
  4. Electrical Characteristics:
  5. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
  6. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
  7. Accessories:
    - a. Water Connections: Brass.
    - b. Dip Tube: Brass.
    - c. Drain valve.
    - d. Anode: Magnesium.
  8. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

## 2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
1. Amtrol Inc; \_\_\_\_\_: [www.amtrol.com/#sle](http://www.amtrol.com/#sle).
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; contractor to set pressure of expansion tank to match water supply pressure prior to installation. Expansion tank to be mounted vertically.

## 2.03 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
1. Taco Inc.[]: <https://www.tacocomfort.com/#sle>.
  2. Substitutions: See Section 016000 - Product Requirements.

- B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

#### 2.04 SUBMERSIBLE SUMP PUMPS

- A. Manufacturers:
  - 1. Zoeller Company; \_\_\_\_\_: [www.zoeller.com/#sle](http://www.zoeller.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Type: Completely submersible, vertical, centrifugal.
- C. Casing: Cast iron pump body and oil filled motor chamber.
- D. Impeller: Cast iron; open non-clog, stainless steel shaft.
- E. Bearings: Ball bearings.
- F. Sump: Fiberglass basin with steel cover plate; \_\_\_\_ inches (\_\_\_\_ mm) diameter, \_\_\_\_ inches (\_\_\_\_ mm) deep.
- G. Accessories: Oil resistant 6 foot (2 m) cord and plug with three-prong connector for connection to electric wiring system including grounding connector.
- H. Servicing: Slide-away coupling consisting of discharge elbow secure to sump floor, movable bracket, guide pipe system, lifting chain and chain hooks.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Domestic Water Storage Tanks:
  - 1. Provide steel pipe support, independent of building structural framing members.
  - 2. Clean and flush prior to delivery to site. Seal until pipe connections are made.
- D. Pumps:
  - 1. Ensure shaft length allows sump pumps to be located minimum 24 inches (600 mm) below lowest invert into sump pit and minimum 6 inches (150 mm) clearance from bottom of sump pit.
  - 2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

#### END OF SECTION 223000





## SPECIFICATION DESCRIPTION- SPECIFIER'S NOTES:

- 1.01 THESE SPECIFICATIONS ARE INTENDED TO PROVIDE PROSPECTIVE BIDDERS WITH INFORMATION NECESSARY TO UNDERSTAND THE REQUIREMENTS TO PURCHASE AND INSTALL A HIGHLAND TANK ABOVEGROUND FIREGUARD® STORAGE TANK (AST) WITH THE HL-77 TURNKEY FUEL DISPENSING SYSTEM FOR DIESEL FUEL DISPENSING.
- 1.02 THESE SPECIFICATIONS DESCRIBE THE OPERATING CHARACTERISTICS FOR A HIGH-LINK® FUEL MANAGEMENT SYSTEM AND DETAIL THE REQUIREMENTS NECESSARY FOR THE PROPER FUNCTIONING OF THE SYSTEM.
- 1.03 ALL CONNECTIONS ARE TO BE NPT UNLESS SPECIFIED OTHERWISE. ALL PIPE DIAMETERS REPRESENT THE INSIDE DIAMETER (I.D.) UNLESS NOTED OTHERWISE.

## HIGHLAND TANK ABOVEGROUND STORAGE TANK

- 2.01 NOMINAL CAPACITY: 1000-GALLONS, AS INDICATED ON DRAWING. NOMINAL TANK DIMENSIONS: DIAMETER LENGTH
- 2.02 PRIMARY TANK: 4-FEET, 0-INCHES DIAMETER / 10-FEET, 8-INCHES LENGTH. SECONDARY TANK: 4-FEET, 6-INCHES DIAMETER / 11-FEET, 3-INCHES LENGTH.
- 2.03 MINIMUM STEEL THICKNESS FOR PRIMARY TANK: HEAD = 7-GAUGE, SHELL = 7-GAUGE
- 2.04 MINIMUM STEEL THICKNESS FOR SECONDARY TANK: HEAD = 7-GAUGE, SHELL = 7-GAUGE
- 2.05 TANK SHALL BE MANUFACTURED, TESTED, AND LABELED IN CONFORMANCE WITH UNDERWRITERS LABORATORIES'
- 2.06 UL-2085 STANDARD FOR PROTECTED ABOVEGROUND TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS, DOUBLE-WALL CONSTRUCTION. TANK SHALL BE MANUFACTURED AND LABELED IN STRICT ACCORDANCE WITH STEEL TANK INSTITUTE (STI) FIREGUARD® THERMALLY INSULATED, DOUBLE-WALL STEEL ABOVEGROUND STORAGE TANK STANDARDS AS APPLIED BY A LICENSEE OF THE STI. TANK SHALL BE SUBJECT TO THE STI'S QUALITY ASSURANCE PROGRAM AND SHALL BE BACKED BY THE STI 30-YEAR LIMITED WARRANTY.
- 2.07 THE TANK SHALL BE A CYLINDRICAL, HORIZONTAL, STEEL TANK INTENDED FOR THE STORAGE OF FLAMMABLE AND COMBUSTIBLE LIQUIDS AT ATMOSPHERIC PRESSURE. TANK SHALL INCLUDE INTEGRAL STEEL SECONDARY CONTAINMENT AND THERMAL INSULATION THAT PROVIDES A MINIMUM TWO-HOUR FIRE RATING. THE TANK DESIGN SHALL COMPLY WITH UL 2085 "PROTECTED" TANK STANDARD HAVING BEEN TESTED FOR BALLISTICS, IMPACT, HOSE STREAM, AND POOL FIRE PERFORMANCE STANDARDS. TANK SHALL BE DESIGNED FOR POSSIBLE RELOCATION AT A FUTURE DATE. CONCRETE ENCASED TANK DESIGNS ARE NOT EQUAL AND WILL NOT BE PERMITTED.
- 2.08 INNER (PRIMARY) AND OUTER (SECONDARY) TANKS SHALL BE FABRICATED FROM MILD CARBON STEEL WITH FLAT- FLANGED HEADS, AND LAP-WELDS AT ALL SEAMS AND JOINTS. PRIMARY AND SECONDARY TANKS ARE AIR TESTED AT THE FACTORY. (PRIMARY TANK MAY NEED TO BE RETESTED FOR TIGHTNESS AT THE JOBSITE PRIOR TO COMMISSIONING. CONSULT AHJ FOR REQUIREMENTS.) TANK SHALL BE SUPPLIED WITH EMERGENCY VENTS FOR THE PRIMARY AND THE SECONDARY CONTAINMENT TANKS. EMERGENCY VENTING BY "FORM OF CONSTRUCTION" IS NOT EQUAL AND WILL NOT BE PERMITTED.
- 2.09 TANK SHALL COMPLY WITH THE LATEST EDITION OF NATIONAL FIRE PROTECTION

ASSOCIATION NFPA 30 FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE. THE TANK SYSTEM SHALL ALSO MEET OR EXCEED THE REQUIREMENTS OF:

- A. National Fire Protection Association NFPA 30A Automobile And Marine Service Station Code
- B. 1997 Uniform Fire Code (UFC) "Protected" AST criteria as per Appendix II-F, including ballistics protection
- C. California Air Resources Board (CARB) testing requirements for air emissions
- D. International Fire Code

## 2.10 CONSTRUCTION

- A. Tank shall be of double-wall construction and provide complete secondary containment of the primary storage tank's contents by an impervious steel outer wall. Inner and outer tanks shall be manufactured in accordance with UL-142 Standard for Steel Aboveground Tanks for
- B. Flammable and Combustible Liquids as referenced in UL-2085. Tank shall be fabricated of mild carbon steel with shell seams of continuous lap weld construction.
- C. A minimum of 3" of porous, lightweight monolithic thermal insulation material shall be installed at the factory within the interstitial space between the inner and outer wall. Thermal insulating material:
  - 1. Shall be in accordance with American Society of Testing Materials (ASTM) Standards C-332 and C-495.
  - 2. Shall allow liquid to migrate through it to the monitoring point.
  - 3. Shall not be exposed to weathering and shall be protected by the steel secondary containment outer wall (an exterior concrete wall or vault exposed to the elements will NOT be permitted).
- D. Each tank shall be delivered as a complete UL-listed assembly including the following fittings and components: (All fittings NPT or flanged, shall be supplied with plastic protectors for shipment)
- E. Standard tanks shall include, at a minimum, fittings for normal vent, interstitial monitoring, emergency vent for primary tank, emergency vent for secondary tank, product fill, product pump/supply and liquid level gauge. See standard drawings at [www.highlandtank.com](http://www.highlandtank.com) for quantity, size, and location of fittings on standard tanks. All fittings must be located above the maximum fluid level per UL-2085 / STI Fireguard requirements. Normal vent sizes are equal to, or larger than largest fitting to be used for fill or withdraw from the tank. Emergency vent size is based on the wetted surface area of the tank.

## 2.11 TWO (2) WELDED-ON SADDLES - DESIGN, SIZE AND LOCATION DETERMINED PER STI SPECIFICATIONS

## 2.12 LIFTING LUGS SHALL BE PROVIDED AT BALANCING POINTS TO FACILITATE HANDLING AND INSTALLATION.

- A. Exterior Protective Coating:

## 2.13 SURFACE PREPARATION: GRIT BLAST - SSPC-SP-6 WHITE BLAST

## 2.14 FINISH: WHITE URETHANE PAINT SYSTEM 5-7 DFT ON THE SHELL AND HEADS.

## 2.15 EXECUTION

- A. Tank to be set level on a solid foundation of reinforced concrete constructed by owner of installer.
- B. Installation and testing shall be in strict accordance with STI's Fireguard® Installation Instructions and performed by a licensed installer.

## 2.16 WARRANTY

- A. The tank is warranted by Highland Tank & Mfg. Co. to be free from defects in manufacturing, workmanship, and materials. Highland Tank will repair or replace, at its sole discretion F.O.B. factory, within a period of one year after date of shipment, any item of our manufacture. All other items shall be warranted by their respective manufacturers. Liability hereunder is limited, as stated above, and does not include labor, installation costs, indirect or consequential damages of any kind. Tanks must be returned to the factory and if found to be defective upon examination, will be repaired, replaced or credit will be issued at our option.
- B. Tank to be manufactured by Highland Tank at one of the following locations: Stoystown, PA; Manheim, PA; Watervliet, NY; Greensboro, NC; Friedens, PA; Clarkston, MI or Mancelona, MI.
  - 1. The storage tank shall contain Diesel

## TURNKEY FUEL DISPENSING SYSTEM PACKAGES

## 3.01 VENT PACKAGE

- A. Diesel Vent Package
  - 1. Includes (2) emergency vents, opening size and connection type depending on tank volume and fill package. Emergency vents for diesel applications are lightweight aluminum and spring tensioned for operation.
    - a. Diesel emergency vents operate at 8oz/sq.in. pressure
  - 2. Atmospheric/Normal Vent
    - a. Vent size is dependent on UL-142 codes based on tank size and fill size. Tanks with a 2" fill will use 2" vents. Tanks with a 3" fill will use a 3" vent.
  - 3. Standpipe
    - a. Standpipe length is sized the same diameter as the atmospheric vent and is tall enough to bring the vent to the required venting height (12').

## 3.02 GAUGE PACKAGE

- A. Mechanical Level Gauge
  - 1. A mechanical level gauge is included for an immediate non-electric reliant visual representation of the fluid level in the tank.
    - a. The mechanical gauge shall be a clock gauge installed in a 2" port near the tank filling area.
- B. Mechanical pop-up style leak gauge (standard leak detection) (alternative audible/visual alarm available – please see sections F&G for alternative leak detection methods)

## 3.03 FILL PACKAGE

- A. The fill package provides the necessary components to facilitate tank filling using a truck mounted pumping system. When using a remote fill, for tanks 8,000 gallons and smaller, 2" pipe and accessories are standard. For tanks 10,000 gallons and larger, 3" pipe and accessories are standard.
1. Spill Containment
    - a. For tanks 1,000 gallons, 64" diameter and larger, a remote fill port is used, pipe size dependent on tank volume. For tanks 1,000 gallons, 48" diameter and smaller, a tank top spill bowl (3.5 gallons) is standard.
      - 1) A larger spill bowl may be used if requested.
  2. Quick Connect Coupling
    - a. A 2" male quick connect coupling (cam lock coupling) and dust cap for ease of connection for fuel supplier to fill the tank.
  3. Overfill Prevention Valve
    - a. A 2" overfill prevention valve as a mechanical means to prevent the tank from being overfilled. If the tank is filled above the pre-set max-fill level the float in the valve closes the valve to prevent further filling. A bleed hole in the unit prevents siphoning and relieves fill side pressure. The valve handles flow rates from 5 to 350 GPM. The level shut off provides mechanical closure of the inlet connection when tank level reaches the 90% to 95% preset level. The level shut off allows for a flow rate of less than 2% of rated flow for pressure relief purposes.
    - b. A 2" drop tube is included if the product stored is gasoline. If it is diesel, a drop tube is not necessary, but may be added if desired.
  4. Single Step-Up Mounted on Head of Tank
    - a. A single step is mounted on the head of the tank to facilitate access to the filling area on the tank. The step is on the same head of the tank as the filling station. The step is no more than 11" off the ground, depending on the overall tank height. The stair depth is approx. 20" deep, and the treads are yellow fiberglass grating with grip texture surface for a step surface. The grating allows debris, water, snow, or ice to fall through and provides grip on the step.
    - b. In lieu of the single step, stairs or ladders are available upon request.

## 3.04 PUMP PACKAGE MODEL HL-77

- A. The pump package includes all components necessary to pump fuel from the tank into the desired vehicle. All inlet, outlet, accessory, or pipe diameters as specified are I.D. measurements with NPT connection unless otherwise noted.
1. Dispenser Cabinet with Internal Pump
    - a. The pump is a 220VAC, 5.7-amp max, 3/4 HP pump with a maximum flow rate of 35GPM from the pump outlet.
    - b. Dispenser Cabinet
      - 1) The dispenser cabinet provides a 4-digit readout of gallons pumped per transaction and a totalizer for lifetime gallons pumped.
      - 2) Internal hammer arrestor valve
      - 3) Inline security solenoid valve
      - 4) Internal explosion-proof junction box and intrinsically safe barrier
      - 5) Pulse Output
      - 6) Lever switch to manually turn pump on/off once power is provided to the switch.
      - 7) Nozzle hanger and boot so that nozzle may be hung to the side of the pump when not in use and covered to protect it from the elements.
      - 8) Housing to protect all components from the elements.
      - 9) 2" inlet and 1" outlet
    - c. Pump specs are as follows:

- 1) Connects to a 2" fitting nearest to the dispensing head of the tank.
  - 2) Continuous duty cycle
  - 3) Includes thermal protection for the motor.
  - 4) 1" inlet and outlet
- d. Meter specs are as follows:
  - 1) Meter is integral to the dispenser cabinet above and is not a separate part.
  - 2) 6-40 GPM flow rate
  - 3) Approved for gasoline, diesel, kerosene, and other similar fluids.
  - 4) Accuracy of +/- 1.25%
  - 5) Maximum pressure at 50 psi
  - 6) Operating temp -15 to 140 deg. F.
2. 40 GPM/30 Micron Particulate Spin-On Filter and Filter Head
  - a. Filter captures contaminants flowing from the tank before reaching the vehicle tank.
  - b. Filter specs are as follows:
    - 1) 30 Micron Filter
    - 2) 50psi max
    - 3) 40gpm max
    - 4) The filter head fits the above supplied filter and has a 1" inlet and outlet. Filter head is installed immediately after the meter outlet in a horizontal run of piping.
3. Hose Swivel, Whip Hose, Breakaway, and Nozzle
  - a. The swivel, whip hose, breakaway, and nozzle are common fuel dispensing parts that ensure the functionality and longevity of the fuel dispensing system.
    - 1) The swivel allows the nozzle to naturally move without added stress to the fuel hose.
    - 2) Diesel – 1"
    - 3) The whip hose serves as a flexible connector piece of hose to connect the breakaway to a rigid pipe outlet.
    - 4) Diesel – 1"
    - 5) The breakaway serves to protect the entire fuel dispensing system if the vehicle driver forgets to remove the nozzle from the vehicle after fueling. The breakaway is designed to break with approx. 600lbs of pulling force and is non-reconnectable.
    - 6) Diesel – 1"
    - 7) The nozzle inserts into the vehicle fuel inlet to dispense fuel into the vehicle. The nozzle is automatic, has a locking position trigger, and a rubber colored handle to indicate the fuel type.
    - 8) Diesel, Green Handle– 1"

### 3.05 HOSE PACKAGE

- A. The hose package includes the hose, hose reel and ball stop. Hose packages are offered in both 15' and 25' configurations for both gasoline and diesel applications.
  1. The fuel hose has a static wire and internal spring guards.
  2. The hose reel is a manual spring rewind model that has been pre- selected to handle the diameter and length hose provided with the hose package.
  3. The ball stop is provided to clamp around the fuel hose to prevent stress on the threaded connections from the force of the hose reel pulling the hose back.
  4. The flexible hose connects the hard piping section out of the dispenser outlet to the hose reel inlet.
  5. A hose reel mount is supplied to attach the hose reel directly to the hose.
    - a. The mount is comprised of 2 painted pieces of angle steel welded vertically to the tank head. Angles face out for ease of access behind the legs. Steel pieces are sized and space according to the hose reel mounting hole locations. Mount is centered at approx. 36" from the ground.
    - b. Hose packages are available in the following configurations, please select:

- 1) ?Diesel- 1" Accessories – 15' Hose
- 2) Hose reel for 1" x 15' Hose
- 3) 15'x 1" Hose
- 4) Ball Stop for 1" Hose
- 5) SS Braided Flexible Hose – 1"
- 6) ?Diesel- 1" Accessories – 25' Hose
- 7) Hose reel for 1" 25' Hose
- 8) 15'x 1" Hose
- 9) Ball Stop for 1" Hose.
- 10) SS Braided Flexible Hose – 1"

### 3.06 ELECTRONIC LEAK/OVERFILL PACKAGE

- A. The electronic leak & overfill package provides audible/visual local alarms for both interstitial leak and 90% full alarms.
1. The leak sensor is an interstitial float-switch style sensor. The sensor activates with any liquid intrusion in the interstitial space of the tank. The sensor housing is mesh stainless steel, the stem is PVC, the float is Buna. A NEMA 4 head is included.
    - a. Sensor used in place of pop-up leak gauge as mentioned above.
  2. The overfill sensor is a one-float stem sensor that activates when the tank reaches 90% full. The sensor stem is made of brass, the floats are Buna. A NEMA 4 head is included.
  3. The sensors are wired to alarm relays built into the FuelShield enclosure as specified below in section G. If the FuelShield is not used with the system, then an alternate 2 channel alarm panel may be used for audible/visual alarm functions.

### 3.07 HIGH-LINK® FUELSHIELD MINI PLUS PACKAGE

- A. Provide a FuelShield MINI Plus fuel management system that uses the High-LINK cloud-based software application for system operation, maintenance, reporting, alerts, and data analysis.
1. Provide a cabinet-style pump control and fuel management system that requires user and vehicle authentication before fuel may be dispensed into the vehicle. The FuelShield records the driver, vehicle, date, time, pump
  2. number/ID, fuel type, and amount of fuel dispensed and creates a transaction. The FuelShield MINI is pre-mounted to the head of the tank when the Turnkey Assembly Package is selected as described below in section H.
- B. Standard Authentication Options (required)
1. Pin Pad Entry for Driver Authentication
  2. User enters pin codes on the FuelShield keypad to identify the driver.
  3. Dallas Key for Vehicle Authentication
  4. User presents the magnetic button attached to a fob handle w. keyring holder to the reader on the FuelShield to identify the vehicle.
  5. Additional/alternate authentication options available in section 5 below.
- C. User input is required before beginning fueling, such as vehicle odometer, job number, purchase order number, site number, VIN number, or any other alphanumeric information the site owner/operator may wish to collect at the time of fueling.

### 3.08 FUELSHIELD MINI POWER/CONTROL REQUIREMENTS

- A. Operating Voltages: 12-24VDC or 110-230VAC
- B. Control rating: 15 Amps
1. FuelShield MINI Construction
    - a. Enclosure Material:

- 1) Hot compression molded fiberglass reinforced polyester (thermoset)
  - (a) Locking front door
  - (b) Enclosure Ratings
  - (c) UL508A, UL50 & UL50E
  - (d) NEMA 1,3,3S,3R,4X,12
  - (e) NFPA NO. 1101 Flame Spread: Class A (1)
  - (f) Flammability Rating: UL94-5V
  - (g) Self-Extinguishing: Non halogenated, non-flame propagating
  - (h) Physical Dimensions: 13" W x 15" H x 7" D (Approx.)
  - (i) Operating Temperature Range
  - (j) -32F to 135F without heater
  - (k) -55F to 135F with heater
  - (l) Controls/Inputs
  - (m) Controls up to (4) Fuel Hoses.
  - (n) Accepts up to (8) tank probes.
  - (o) Manage unlimited drivers and vehicles.
2. Internet Access – Internet access is required for use of system. The FuelShield Plus system is managed from and reports to the High-LINK® cloud-based software application using an internet connection. The unit will continue to function and record transactions locally if offline if power is provided, and the transaction data will synchronize to the cloud when the connection is restored.
  - a. Cellular (4G GPRS – Verizon or AT&T) is standard on all units unless specified otherwise.
  - b. Other available internet communication options (please indicate)
    - 1) ?Wi-Fi
    - 2) ?Ethernet/Hardwired Internet/LAN Cable

### 3.09 SYSTEM STANDARD OPTIONS

- A. Heater Kit (component warmth and anti-condensation)
- B. Alphanumeric keypad with function buttons
- C. Dallas key reader
- D. GPRS Modem
- E. Alarm Relays for Interstitial/Overfill audible/visual alarms.
- F. 2-row, 16-block backlit LCD Digital Display
- G. Emergency stop button.
  1. The emergency stop button will only stop the power from flowing to the pump, not cut power to the entire site. Some jurisdictions require an emergency stop button to cut power to the entire fueling area in case of emergency. This emergency stop button does not replace this function and is not intended to do so. Please inquire with your local AHJ for local codes and regulations.
    - a. Other options shall be added depending on the desired system setup, including:
      - 1) HID Card Reader
        - (a) RFID Authorization System Kit
        - (b) Magnetic Card Reader Kit
        - (c) Wi-Fi Modem
    - b. LevelShield Magnetostrictive Probe
      - 1) The LevelShield Magnetostrictive Probe monitors tank levels, including tank product level, water level, and liquid temperature. Level monitoring is



accomplished with two floats on a rigid shaft. One float will float on fuels, the other will only float on water. A thermocouple is centered along the interior of the probe shaft for temperature monitoring.

- 2) The Probe is sized according to the tank diameter.
- 3) The probe is supplied with a  $\frac{3}{4}$ " compression fitting to allow for subtle flexibility of the probe height in the tank. It is also supplied with a  $\frac{3}{4}$ "x2" reducer bushing to allow the probe to mount in a 2" fitting. 2" is the minimum fitting size to install the probe due to the float diameter. Please refer to the probe installation manual for more details, available upon request from your Highland Tank representative.
- 4) The probe is pre-installed in the tank and pre-wired to the FuelShield system when the turnkey assembly package is selected as described below. See section H.
- 5) Construction
  - (a) NEMA 4X rated aluminum blue-painted head.
  - (b) 316 Stainless Steel Tubing Body
  - (c) SP-P Fuel Float, SP-A Water Float
  - (d) Accuracy: +/- 0.02", Resolution +/- 0.004"
- 6) Operating Temperature a. -40F – 185F
- 7) RS-485 Communication
- 8) Certifications
  - (a) Explosion-Proof ATEX CESA & IENRIS-OMIL R85
  - (b) Class 1, Div. 1 Zone 1&2
- c. On-Site Startup and Installation assistance
  - 1) One technician will come to the site to perform startup on the system. The technician will train site administrators and end-users on the system operation and basic troubleshooting procedures. The technician will also perform the High-LINK software initial training for the site administrator. Further training will be conducted via a skype web presentation upon request from the end user.

#### H. Turnkey Assembly Package

1. The turnkey assembly package includes complete in-house assembly, wiring, and piping of all accessories and components to the specified tank when Highland Tank's standard system configuration is used. Any modifications to Highland Tank's standard design may require some components ship loose.
2. Turnkey assembly packages apply only to tanks 96" in diameter and smaller. Tanks with larger diameters may require some accessories to be installed on site due to shipping height restrictions. Ship loose components will be shown on the system drawing. Any component that will ship loose will be pre-fit in the factory for easy assembly on site.
3. The atmospheric vent or pressure/vacuum vent must ship loose due to shipping height restrictions and shall be installed by others on-site.
  - a. Tank Head Component Mounting
    - 1) Strips of Unistrut shall be welded horizontally across the head of the tank with the angle down for mounting of all tank head components and bracing of any pipe, conduit, Junction Box, or other accessory. Unistrut will be spaced 12" apart, centered to the horizontal centerline of the tank.
  - b. Electrical Hardware
    - 1) A Class 1, Div.1 explosion-proof rated junction box serves as a single- point electrical power connection for this system. A labeled terminal strip will be mounted in the box.
    - 2) All wiring in rigid conduit.
    - 3) All conduit junctures use explosion-proof seal-off fittings.
    - 4) All wiring, including high and low voltages, will shall be completed prior to shipping.
    - 5) System function testing will be performed prior to shipment.
  - c. Piping

- 1) Piping in this system shall consist of piping from the pump to the dispenser cabinet, and from the dispenser cabinet to the hose reel.
    - (a) The pump outlet is 1". A bushing will be used to increase to 2" directly off the pump to accommodate the dispenser cabinet inlet size, which is 2".
  - 2) Piping shall be 2" schedule 40 black steel pipe, painted white.
    - (a) Piping shall include breakdown flanges immediately after the pump, halfway down the vertical pipe run, and immediately before turning up into the dispenser cabinet.
  - 3) No valves in the piping run from the dispenser outlet to the hose reel inlet are in the standard design for this turnkey package. If valves are required/desired, please discuss with Highland Tank.
  - 4) All connections must always be tightened after shipment. Always check for leaks upon first use of the entire system.
  - 5) Valves are installed in the piping run as follows:
    - (a) 2" Stainless Steel Full Port Locking Ball Valve
    - (b) 1-1/4" Pressure Relief Valve with copper line back into the tank
    - (c) 2" Anti-Siphon Valve
    - (d) 2" External Emergency Valve
    - (e) 2" Bottom-Clean Out Strainer with 40 Mesh
    - (f) 2" Emergency Valve
    - (g) Installed in bottom of the dispenser
- I. Canopy & Explosion-Proof Light Package (96" dia & larger tanks only)
1. Provide a tank canopy extends 6' off the head of the tank over the dispensing area. Painted white.
  2. Included:
    - a. An explosion-proof 120VAC LED light shall be mounted in the center of the canopy to light the area below.
    - b. An explosion-proof photocell shall be mounted halfway down the tank head for auto on at dusk and auto off at dawn functionality.
    - c. All wiring shall be in rigid conduit with seal-offs at every juncture.
- J. High-LINK® Software Application & Cellular Data
1. The High-LINK® software application allows system administrators to efficiently manage the entire fueling operation from any web browser on any computer, tablet, or smartphone.
    - a. The application allows unlimited access, unlimited users, and allows the user to remotely manage their fueling operation, such as adding/removing drivers and vehicles from the system, running fuel use reports, setting customizable alerts, checking tank levels, bidding for fuel prices, reconciling inventory, and more. [Click here](#) to learn more about High-LINK® Integrated Systems.
    - b. The application is a yearly recurring software agreement.
  2. Cellular Data
    - a. Cellular data is the standard form of internet connectivity from the FuelShield Plus system to the software application. A cellular modem is standard with all FuelShield models. Cellular data is not applicable if another form of internet communication is used as specified above. The standard service provider is Verizon. AT&T may be used upon request or if coverage is better in the area with AT&T.
- K. Additional FuelShield Authentication Options:
1. Magnetic Card (Driver or Vehicle)
    - a. The user swipes the card in the card reader on the FuelShield to identify either the driver, vehicle, or both.
  2. HID Fob/Card (Driver or Vehicle)
    - a. User presents a wireless, contactless HID fob in front of the HID reader (optional) on the FuelShield to identify the driver.

3. RFID (Vehicle Only)
  - a. RFID rings are placed around the fuel inlet of the vehicle, and a reader is placed on the nozzle. The nozzle reader wirelessly identifies the vehicle when it is inserted into the vehicle fuel inlet. The reader wirelessly communicates to the FuelShield.
  - b. The system requires the nozzle to be in the vehicle during the entire duration of the transaction. When it is removed, the transaction will stop.
4. Barcode Reader (Vehicle Only)
  - a. A barcode scanner will scan a vehicle barcode to identify the vehicle. The barcode can represent any number assigned to the vehicle, such as: VIN, stock number, asset number, etc. The barcode scanner will be in a separate enclosure with a locking handle. It shall be mounted on a separate pedestal as manufactured by Highland Tank. The barcode reader is weatherproof, rated for cold temperatures, and highly impact resistant.
5. Fleet Fueling Card Integration (Vehicle Only)
  - a. FuelShield can be used in conjunction with EFS/WEX fleet fueling card solutions. Fleet fueling cards allow over-the-road and private fueling transactions to work seamlessly together. Please inquire for more information.
6. Indicate choices by choosing from the drop-down lists below:
  - a. Choose an item. Driver ID
  - b. Choose an item. Vehicle ID

#### 3.10 ENGINEERING NOTE:

- A. The fuel dispensing system as described above represents a standard design with standard accessories. The system is customizable to meet specific or alternate demands as required per the site conditions. Please call 814.893.5701 to discuss system needs with a product specialist.

**END OF SECTION 223500**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Flush valve water closets.
- B. Bidets.
- C. Wall hung urinals.
- D. Lavatories.
- E. Wall-hung, solid surface, multistation lavatory units.
- F. Wall-hung, multistation wash fountains.
- G. Sinks.
- H. Under-lavatory pipe supply covers.
- I. Bathtubs and showers.
- J. Shower receptors.
- K. Eye wash fountains.
- L. Bottle filling drinking fountains.
- M. Service sinks.

## 1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Owner-furnished fixtures.
- B. Section 221005 - Plumbing Piping.
- C. Section 221006 - Plumbing Piping Specialties.
- D. Section 223000 - Plumbing Equipment.
- E. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

## 1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- C. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- D. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2017).
- E. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.
- F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.

- G. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- H. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.
- I. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- J. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.
- K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- L. FM (AG) - FM Approval Guide; current edition.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- N. ITS (DIR) - Directory of Listed Products; current edition.
- O. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- P. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- Q. UL (DIR) - Online Certifications Directory; Current Edition.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- E. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Faucet Washers: One set of each type and size.
  - 3. Extra Lavatory Supply Fittings: One set of each type and size.
  - 4. Extra Toilet Seats: One of each type and size.
  - 5. Flush Valve Service Kits: One for each type and size.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

## 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

## PART 2 PRODUCTS

## 2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

## 2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.
- D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

## 2.03 FLUSH VALVE WATER CLOSETS

- A. Water Closets:
  - 1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 2. Manufacturers:
    - a. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
    - b. Substitutions: See Section 016000 - Product Requirements.
- B. Flush Valves:
  - 1. Manufacturers:
    - a. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
    - b. Substitutions: See Section 016000 - Product Requirements.
- C. Toilet Seats:
  - 1. Manufacturers:
    - a. American Standard, Inc; \_\_\_\_\_: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  - 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.
- D. Water Closet Carriers:

1. Manufacturers:
  - a. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - b. Substitutions: See Section 016000 - Product Requirements.
2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

#### 2.04 WALL HUNG URINALS

- A. Manufacturers:
  1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Flush Valves:
  1. Manufacturers:
    - a. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
    - b. Substitutions: See Section 016000 - Product Requirements.
- C. Urinal Carriers:
  1. Manufacturers:
    - a. Zurn Industries, LLC; Z1221: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

#### 2.05 LAVATORIES

- A. Manufacturers:
  1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  2. Substitutions: See Section 016000 - Product Requirements.

#### 2.06 SINKS

- A. Manufacturers:
  1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  2. Substitutions: See Section 016000 - Product Requirements.

#### 2.07 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. Manufacturers:
  1. Plumberex Specialty Products, Inc; \_\_\_\_\_: [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Basis of Design: Plumberex Specialty Products, Inc; [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
  1. Slim Fit Under-Lavatory Insulators (Non-Sewn): Plumberex Trap Gear.
- C. General:
  1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
  2. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
    - a. Comply with ASTM C1822 Type I for covers on accessible lavatory piping.
    - b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
    - c. Comply with ICC A117.1.

## 2.08 SHOWERS

- A. Manufacturers:
  - 1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Thermostatic Mixing Valve:
  - 1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## 2.09 BOTTLE FILLING DRINKING FOUNTAINS

- A. Manufacturers:
  - 1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - 2. Substitutions: See Section 016000 - Product Requirements.

## 2.10 SERVICE SINKS

- A. Manufacturers:
  - 1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - 2. Substitutions: See Section 016000 - Product Requirements.

## 2.11 EMERGENCY EYE AND FACE WASH

- A. Manufacturers:
  - 1. See Plumbing Fixture Schedule on Sheets P1 002 and P2 003.
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

## 3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

## 3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.



- D. Install and secure fixtures in place with wall supports and bolts.

**3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

**3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

**3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION 224000**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section describes the general requirements for all mechanical items and systems required by the Contract Documents.
- B. Comply with all Contract Requirements, General Conditions, Supplementary Conditions and Division 1 Sections applying to or affecting the Work of Division 23.
- C. Unless specifically dimensioned, the Work shown on the Drawings is in diagrammatic form only to show general arrangement.
- D. Include, in the Work, all accessories and appurtenances, necessary and integral, for the intended operation of any system, component or device, as such systems, components and devices are specified.
- E. Do not install pipe or conduit through ductwork.
- F. If the pipe or duct size shown on the Drawings does not match the connection size of the equipment that it is connected to, provide the necessary transition pieces at the piece of equipment.
- G. Do not use or allow to be used asbestos or asbestos-containing materials on this project. Be rigorous in assuring that all materials, equipment, systems and components thereof do not contain asbestos. Any deviations from this requirement shall be remedied at the Contractor's expense without regard to prior submittal approvals.

## 1.02 RELATED DOCUMENTS

- A. The General Conditions and General Requirements Division 1 apply to the Work of this Section.

## 1.03 REFERENCE STANDARDS

- A. Compliance with the following codes and standards shall be required:
  - 1. Codes, Rules and Regulations of the State of New York
  - 2. USAS USA Standards Institute (Formerly ASA)
  - 3. AMCA Air Moving and Conditioning Association
  - 4. ADC Air Diffusion Council
  - 5. NEMA National Electrical Manufacturers Association
  - 6. FM Factory Mutual
  - 7. NFPA National Fire Protection Association
  - 8. ASTM American Society for Testing Materials
  - 9. UL Underwriters Laboratories, Inc.
  - 10. NEC National Electrical Code
  - 11. ASME American Society of Mechanical Engineers
  - 12. ANSI American National Standards Institute
  - 13. OSHA Occupational Safety and Health Act
  - 14. BSA Board of Standards and Appeals
  - 15. MEA Materials and Equipment Acceptance
  - 16. DEC New York State Department of Environmental Conservation - 6 NYCRR Part 613 Handling and Storage of Petroleum
  - 17. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers.
  - 18. AWWA American Water Works Association

|     |                                         |                                                                          |
|-----|-----------------------------------------|--------------------------------------------------------------------------|
| 19. | MSS                                     | Manufacturer's Standardization Society of the Valve and Fitting Industry |
| 20. | ARI                                     | American Refrigeration Institute                                         |
| 21. | SMACNA                                  | Sheet Metal and Air Conditioning Contractor's National Association       |
| 22. | TEMA                                    | Tubular Exchanger Manufacturers Association                              |
| 23. | F.S. or FED                             | Spec. Federal Specification                                              |
| 24. | ASA                                     | Acoustical Society of America                                            |
| 25. | NACE                                    | National Association of Corrosion Engineers                              |
| 26. | ASSE                                    | American Society of Sanitary Engineers                                   |
| 27. | New York State Building Code            |                                                                          |
| 28. | New York State Fire Code                |                                                                          |
| 29. | New York State Existing Building Code   |                                                                          |
| 30. | New York State Fuel Gas Code            |                                                                          |
| 31. | New York State Plumbing Code            |                                                                          |
| 32. | New York State Energy Conservation Code |                                                                          |
| 33. | New York State Mechanical Code          |                                                                          |
| 34. | New York State Industrial Code Rules    |                                                                          |
| 35. | IRI                                     | Industrial Risk Insurers                                                 |
| 36. | AGA                                     | American Gas Association                                                 |
| 37. | AABC                                    | American Air Balance Council                                             |
| 38. | NEBB                                    | National Environmental Balancing Bureau                                  |
| 39. | AWS                                     | American Welding Society                                                 |

#### 1.04 DEFINITIONS

- A. "Provide" means furnish and install, complete the specified material, equipment or other items and perform all required labor to make a finished installation.
- B. "Furnish and install" has the same meaning as given above for "Provide."
- C. Refer to General Conditions for other definitions.

#### 1.05 ABBREVIATIONS

- A. Reference by abbreviation may be made in the Specifications and the Drawings in accordance with the following list:
  - 1. HVAC Heating, Ventilating and Air Conditioning
  - 2. CM Construction Manager
  - 3. AC Air Conditioning
  - 4. H & V Heating and Ventilating
  - 5. AWG American Wire Gauge
  - 6. BWG Birmingham Wire Gauge
  - 7. USS United States Standard
  - 8. B & S Brown & Sharpe
  - 9. OS & Y Outside Screw and Yoke
  - 10. IBBM Iron Body Brass Mounted
  - 11. WSP Working Steam Pressure
  - 12. PSIG Pounds per Square Inch Gauge
  - 13. PRV Pressure Reducing Valve
  - 14. GPM Gallons per Minute
  - 15. MBH Thousand BTU per hour
  - 16. BTU British Thermal Units
  - 17. WG Water Gage
  - 18. LB Pound (Also shown as: #)
  - 19. ASME American Society of Mechanical Engineers

- 20. ASTM American Society for Testing Materials
  - 21. ABMA American Boiler Manufacturers Association
  - 22. ASA American Standards Associates
  - 23. MER Mechanical Equipment Room
- See Drawings for additional abbreviations

#### 1.06 REVIEW OF CONTRACT DOCUMENTS AND SITE

- A. Give written notice with the submission of bid to the Architect/Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.
- B. Contractors shall acknowledge that they have examined the Plans, Specifications and Site, and that from his own investigations he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, utilities, roads and uncertainties of weather; the composition and condition of the ground; the characters quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect the Work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for successfully performing the Work.
- C. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

#### 1.07 MEASUREMENTS

- A. Base all measurements, both horizontal and vertical from established bench marks. Make all Work agree with these established lines and levels. Verify all measurements at site; and check the correctness of same as related to the Work.

#### 1.08 LABOR AND MATERIALS

- A. Provide all materials and apparatus required for the Work of new and first-class quality. Furnish, deliver, arrange, erect, connect and finish all materials and equipment in every detail, so selected and arranged as to fit properly into the building spaces.
- B. Remove all materials delivered, or work erected, which does not comply with Drawings or Specifications, and replace with proper materials, or correct such work as directed, at no additional cost to the Owner.

#### 1.09 COVERING OF WORK

- A. Do not cover up or hide from view any duct, piping, fitting, or other work of any kind before it has been examined or approved by the Architect/Engineer and/or other authority having jurisdiction over the same. Remove and correct immediately any unacceptable or imperfect work or unauthorized or disapproved materials discovered immediately after being disapproved.

## 1.10 PROTECTION

- A. Protect the Work and material of all trades from damage and replace all damaged material with new.
- B. Protect work and equipment until the Work is finally inspected, tested, and accepted; protect the Work against theft, injury or damage; and carefully store material and equipment received on site which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Preserve all public and private property, along and adjacent to the Work, and use every precaution necessary to prevent damage or injury thereto. Use suitable precautions to prevent damage to pipes, conduits and other underground structures or utilities, and carefully protect from disturbance or damage all property marks until an authorized agent has witnessed or otherwise referenced their location, and do not remove them until directed.

## 1.11 CUTTING AND PATCHING

- A. Provide all cutting and rough patching required for the Work. Perform all finish patching.
- B. Furnish and locate all sleeves and inserts required before the floors and walls are built, pay the cost of cutting and patching required for pipes where sleeves and inserts were not installed in time, or where incorrectly located. Provide all drilling required for the installation of hangers.
- C. Punch or drill all holes cut through concrete slabs or arches from the underside. Do not cut structural members without the approval of the Architect/Engineer. Perform all cutting in a manner directed by the Architect/Engineer.
- D. Do not do any cutting that may impair strength of building construction. Do not drill any holes, except for small screws, in beams or other structural members without obtaining prior approval. All Work shall be done in a neat manner by mechanics skilled in their trades and as approved.

## 1.12 SUBMITTALS

- A. Submit for review, shop drawings for all materials and equipment furnished and installed under this Contract. Submissions shall include but not be limited to:
  - 1. Ductwork layout drawings, air devices and accessories
  - 2. Breeching layout drawings
  - 3. Piping and equipment layout drawings.
  - 4. Piping materials, valves, hangers, supports and accessories
  - 5. Automatic temperature control equipment, diagrams and control sequences
  - 6. Equipment, fixtures, and appurtenances
  - 7. Insulation
  - 8. Rigging Plan - Include the name of the rigging company; a layout drawing that details the crane with its outriggers extended outward. Provide dimensions showing how rigging operations will affect the road and parking lines being used, the type of crane and its specification including crane arm height, lift capacity, crane reach.
- B. Reports
  - 1. Compliance with listings and approvals for equipment and for fire ratings.
  - 2. Acceptance certificates from inspecting agencies.
  - 3. Complete printed and illustrated operating instructions in report format.
  - 4. Manufacturer's performance tests of equipment.
  - 5. Field pipe and duct testing reports.
  - 6. Field operating test results for equipment.

7. Performance report on the balancing of air and water systems.
  8. Performance reports for vibration isolation equipment.
  9. Manufacturer's reports on motorized equipment alignment and installation.
- C. Specific references to any article, device, product or material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing a basis of cost and a standard of quality. All devices shall be of the make and type listed by Special Agencies, such as the Underwriters' Laboratories, and where required, approved by the Fire Department.

#### 1.13 SPACE ALLOTMENTS AND SUBSTITUTIONS

- A. The space allotments and equipment layouts on the Drawings are based on the manufacturer's model indicated or scheduled as the "Basis of Design". Ensure that any equipment that is submitted other than the "Basis of Design" will fit in the space allotment and will provide the necessary maintenance clearances as recommended by the manufacturer. If maintenance clearances are not met, pay for any changes such that maintenance clearances will be met.
- B. Bear all costs associated with re-layout of the equipment, changes to piping/ductwork, and other changes as required if approved equipment other than the "Basis of Design" equipment is purchased. This shall also include any structural steel modifications and structural steel design changes. Submit, at no cost to the Owner, a steel design stamped by a structural engineer licensed in the state in which the Work is to be performed for structural modifications that must be made resulting from the use of equipment other than the "Basis of Design" or not specified.

#### 1.14 PAINTING

- A. Prime paint all bare supplemental steel, supports and hangers required for the installation of Division 23 Work in accordance with "Painting" Specification Section. Touch up welds of galvanized surfaces with galvanizing primer.

#### 1.15 MATERIAL SAFETY DATA SHEETS

- A. Submit material safety data sheets (MSDS) for all chemicals, hydraulic fluids, seal oils, lubricating oils, glycols and any other hazardous materials used in the performance of the Work, in accordance with the US Department of Labor, Occupational Safety and Health Administration (OSHA) hazard communication and right-to-know requirements stipulated in 29 CFR 1910.1200 (g).

#### 1.16 MOTORS AND STARTERS

- A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.
- B. Equip motors for belt driven equipment with rails with adjusting screws for belt tension adjustment. Weather protect motors exposed to the weather.
- C. Install high efficiency electric motors for air handling units, relief fans, and exhaust fans.
- D. Provide all motors for use with Variable Frequency Drives with "high efficiency inverter duty" insulation class "F" with class "B" temperature rise and that conform to or exceed the International Energy Conservation Code or the Federal EP Act of 1992 requirements for efficiency.
- E. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:

1. Manufacturer
  2. Type
  3. Model
  4. Horsepower
  5. Service Factor
  6. RPM
  7. Voltage/Phase/Frequency
  8. Enclosure Type
  9. Frame Size
  10. Full-Load Current
  11. UL Label (where applicable)
  12. Lead Connection Diagram
  13. Bearing Data
  14. Efficiency at Full Load.
- F. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.
- G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.
- H. Protect motor starters on equipment located outdoors in weatherproof NEMA 4X enclosures.
- I. Provide weatherproof NEMA 4X disconnect switches when located outdoors.
- J. Motor Characteristics:
1. 120V/1/60 Hz, 208V/1/60 Hz or 240V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 C. continuous rise.
  2. 208V/3/60 Hz, 240V/3/60 Hz or 460/3/60 Hz: NEMA B, normal starting torque, single speed, squirrel-cage type, open drip-proof, rated 40 C continuous rise, with ball bearings rated for B-10 life of 100,000 hours and fitted with grease fittings and relief ports. Provide motors with aluminum end brackets with steel inserts in bearing cavities.

#### 1.17 ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

- A. Install the Work in such a manner that noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, do not to exceed sound pressure levels determined by the noise criteria curves published in the ASHRAE guide.
- B. Acoustical Tests
1. Owner may direct the Contractor to conduct sound tests for those areas he deems too noisy.
  2. If NC level exceeds the requirements of the Contract Documents due to improper installation or operation of mechanical systems, make changes or repairs to bring noise levels to within required levels.
  3. Retest until specified criteria have been met.

#### 1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instructions and Demonstration for Owner's Personnel
1. Provide operating and maintenance instruction to the Owner when project is completed and all HVAC equipment serving the building is ready to be turned over to the Owner.
  2. Turn over the HVAC equipment to the Owner only after the final testing and proper balancing of HVAC systems.

3. Instruct the Owner's personnel in the use, operation and maintenance of all equipment of each system.
4. The above instruction requirements are in addition to that specified for specific equipment or systems. Conform to specified requirements if more stringent or longer instruction is specified for specific equipment or systems.

#### 1.19 CODES, RULES, PERMITS & FEES

- A. Give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, in connection with the Work. Unless indicated otherwise, fees for all utility connections, extensions, and tap fees for water, storm, sewer, gas, telephone, and electricity will be paid directly to utility companies and/or agencies by the Owner. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for the Work and deliver same to the Owner's Representative before request for acceptance and final payment for the Work.
- B. Conform to the requirements of the NFPA, NEC, FM, UL and any other local or State codes which may govern.

#### 1.20 RECORD DRAWINGS

- A. During the progress of the Work, make a record set of drawings of all changes by which the actual installation differs from the Drawings.
- B. Create all record drawings in AutoCAD version 2002 or later in .dwg format. Upon completion of the Work, submit to the Architect/Engineer for approval three complete sets of hard copies of the record drawings, of the same size as the Drawings for approval. Upon approval by the Architect/Engineer furnish the Owner a CD copy of the record drawings along with one hard copy for his records.

### PART 2 - PRODUCTS

NOT USED

### PART 3 - EXECUTION

#### 3.01 CLEANING AND ADJUSTING

- A. Cleaning
  1. Blow out, clean and flush each system of piping and equipment, to thoroughly clean the systems.
  2. Clean all materials and equipment; leave in condition ready to operate and ready to receive final finishes where required.
  3. Clean the operating equipment and systems to be dust free inside and out.
  4. Clean concealed and unoccupied areas such as plenums, pipe and duct spaces and equipment rooms to be free of rubbish and dust.
- B. Adjusting
  1. Adjust and align equipment interconnected with couplings or belts.
  2. Adjust valves of all types and operating equipment of all types to provide proper operation.
  3. Clean all strainers after system cleaning and flushing and again before system startup.
- C. Lubrication
  1. Lubricate equipment as recommended by the manufacturer, during temporary construction use.
  2. Provide complete lubrication just prior to acceptance.



- D. Permanent Equipment Operating During Construction
  - 1. Use only in same service as the permanent applications.
  - 2. Use disposable filters during temporary operation.
  - 3. Replace expendable media, including belts used for temporary operation and similar materials just prior to acceptance of the Work.
  - 4. Repack packing in equipment operated during construction just prior to system acceptance, using materials and methods specified by the equipment manufacturer.
- E. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.
- F. Tools
  - 1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

### 3.02 EQUIPMENT BASES, PLATFORMS AND SUPPORTS

- A. Provide supporting platforms, steel supports, anchor bolts, inserts, etc., for all equipment and apparatus provided.
- B. Obtain prior approval for installation method of structural steel required to frame into building structural members for the proper support of equipment, conduit, etc. Welding will be permitted only when approved by the Architect/Engineer.
- C. Submit shop drawings of supports to the Architect/Engineer for approval before fabricating or constructing.
- D. Provide leveling channels, anchor bolts, complete with nuts and washers, for all apparatus and equipment secured to concrete pads and further supply exact information and dimensions for the location of these leveling channels, anchor bolts, inserts, concrete bases and pads.
- E. Where supports are on concrete construction, take care not to weaken concrete or penetrate waterproofing.

### 3.03 ACCESSIBILITY

- A. Install valves, dampers and other items requiring access conveniently and accessibly located with reference to the finished building.

### 3.04 USE OF EQUIPMENT

- A. The use of any equipment, or any part thereof, even with the Owner's consent, is not an indication of acceptance of the Work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

### 3.05 MODIFICATIONS OF EXISTING WORK

- A. Coordinate the Work with all other contractors and provide necessary dimensions for all openings. Provide all cuts and openings which are necessary for the Work for passage of piping and ductwork
- B. Upon completion, remove all temporary piping and equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from the Work performed under this Section. Provide rough patching in areas required.

## 3.06 EQUIPMENT INSTALLATION

- A. Locate and set equipment anchor bolts, dowels and aligning devices for equipment requiring them.
- B. Level and shim the equipment; coordinate and oversee the grouting work.
- C. Perform field assembly, installation and alignment of equipment under direct supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.
- D. Alignment and Lubrication Certification for Motor Driven Apparatus
  - 1. After permanent installation has been made and connections have been completed, but before the equipment is continuously operated, have a qualified representative of the equipment manufacturer inspect the installation and report in writing on the manufacturer's letterhead on the following:
    - a. Whether shaft, bearing, seal, coupling, and belt drive alignment and doweling is within the manufacturer's required tolerances so that the equipment will remain aligned in the normal service intended by the Contract Documents and that no strain or distortion will occur in normal service.
    - b. That all parts of the apparatus are properly lubricated for operation.
    - c. That the installation is in accordance with manufacturer's instructions.
    - d. That suitable maintenance and operating instructions have been provided for the Owner's use.
    - e. Make any corrections to items that are required or recommended based on the manufacturer's inspection and have the equipment re-inspected.
- E. Belt Drives
  - 1. V-belt drives - a driving and driven sheave grooved for belts of trapezoidal cross-section. Construct belts of fabric and rubber so designed so as not to touch the bottom of the grooves, the power being transmitted by the contact between the belts and V-shaped groove sides. Design drives for a minimum of 150 percent of motor horsepower. Provide companion type driven sheaves.
  - 2. Select drives to provide for 12-1/2 percent variation in speed, plus or minus, from specified speed. Provide all motors with adjustable sheaves except where indicated otherwise in the Specifications or on the Drawings.
  - 3. Install all fans with adjustable pitch sheaves on their drive motors. Select sheaves to provide air quantities under specified conditions. Put air systems into operation, and determine as a result of the completed air balance the actual size of sheaves required to produce specified air quantities on installed systems. The adjustable pitch sheaves shall then be replaced with the proper size fixed sheaves. Remove adjustable pitch sheaves from premises. Provide fixed motor sheaves manufactured by Wood's.
  - 4. Where indicated on the Drawings or specified, provide spare motor, bearings, and belts.
- F. Machinery Guards
  - 1. Protect motor drives by guards furnished by the equipment manufacturer or in accordance with the Sheet Metal and Air Conditioning Contractors National Association's Low Pressure Duct Manual. Provide guards of all types approved as acceptable under OSHA Standards.
- G. Equipment Start-up
  - 1. Require each equipment manufacturer to provide qualified personnel to inspect and approve equipment and installation and to supervise the start-up of the equipment and to supervise the operating tests of the equipment.
  - 2. If a minimum number of hours for start-up and instruction are not stated with the equipment specifications, these shall be 2 full 8-hour working days as a minimum.

3. Advise Owner of start-up at least 72 hours in advance.

### 3.07 CLOSEOUT PROCEDURES

- A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instructions in the proper operation and maintenance of the entire Work. Where installers are not expert in the required procedures, include instruction by the manufacturer's representatives.
- B. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.
- C. Provide a detailed review of the following items:
  1. Maintenance manuals
  2. Record documents and catalog cuts for each piece of equipment.
  3. Spare parts and materials
  4. Tools
  5. Lubricants
  6. Fuels
  7. Identification systems
  8. Control sequences
  9. Hazards
  10. Cleaning
- D. Warranties, bonds, maintenance agreements, and similar continuing commitments.
- E. Demonstrate the following procedures:
  1. Start-up
  2. Shut-down
  3. Emergency operations
  4. Noise and vibration adjustments
  5. Safety procedures
  6. Economy and efficiency adjustments
  7. Effective energy utilization.
- F. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

| <b>Systems or Equipment</b>       | <b>Training Time (Hours)</b> |
|-----------------------------------|------------------------------|
| Variable Refrigerant Flow Systems | 16 hrs.                      |
| Roof Top Units                    | 8 hrs.                       |
| Boilers and Burners               | 16 hrs                       |
| DDC Control System                | 24 hrs.                      |
| All other equipment               | 4 hrs. (each)                |

Note: Consult individual equipment specification sections for additional training requirements.

- G. Prepare a written agenda for each session and submit for review and approval. Include date, location, purpose, specific scope, proposed attendance and session duration.

- H. Record training sessions in digital format, format as selected by the Owner. Turn over digital files to the Owner after training has been completed.

**END OF SECTION 230010**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. The Work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this Specification. Size hangers and supports to fit the outside diameter of the

## 1.02 REFERENCES

- A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
- C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process
- D. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)
- E. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture
- F. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application
- G. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

## 1.03 QUALITY ASSURANCE

- A. Provide hangers and supports used in fire protection piping systems listed and labeled by Underwriters Laboratories.
- B. Steel pipe hangers and supports shall have the manufacturer's name, part number, and applicable size stamped in the part itself for identification.
- C. Design and manufacture hangers and supports in conformance with MSS SP 58.

## 1.04 SUBMITTALS

- A. Submit product data on all hanger and support devices, including shields and attachment methods. Include as a minimum as part of product data materials, finishes, approvals, load ratings, and dimensional information.
- B. Submit Pipe Hanger and Support Application Schedule.

## PART 2 - PRODUCTS

## 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with these specifications, provide pipe hanger and support systems manufactured by:
  - 1. Cooper B-Line, Inc.
  - 2. Carpenter and Patterson

## 3. Grinnell

## 2.02 PIPE HANGERS AND SUPPORTS

## A. Hangers

1. Uninsulated pipes 2 inch and smaller:
  - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
  - b. Adjustable steel swivel J-hanger, B-Line B3690.
  - c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
  - d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
  - e. Adjustable steel clevis hanger, B-Line B3104 or B3100.
2. Uninsulated pipes 2-1/2 inch and larger:
  - a. Adjustable steel clevis hanger, B-Line B3100.
  - b. Pipe roll with sockets, B-Line B3114.
  - c. Adjustable steel yoke pipe roll, B-Line B3110.
3. Insulated pipe- Hot or steam piping:
  - a. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
  - b. 2-1/2 inch and larger pipes
    - 1) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 with B3160-B3165 series.
    - 2) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.
4. Insulated pipe- Cold or chilled water piping:
  - a. 5 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
  - b. 6 inch and larger pipes:
    - 1) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.
    - 2) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 with B3160-B3165 series.

## B. Pipe Clamps

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

## C. Multiple or Trapeze Hanger

1. Construct trapeze hangers from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.
2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.
3. For pipes subjected to axial movement:
  - a. Strut mounted roller support, B-Line B3126. Use pipe protection shield or saddles on insulated lines.
  - b. Strut mounted pipe guide, B-Line B2417.

## D. Wall Supports

1. Pipes 4 inch and smaller:
  - a. Carbon steel hook, B-Line B3191.
  - b. Carbon steel J-hanger, B-Line B3690.
2. Pipes larger than 4 inch:
  - a. Welded strut bracket and pipe straps, B-Line B3064 and B2000 series.

- b. Welded steel brackets, B-Line B3066 or B3067, with roller chair or adjustable steel yoke pipe roll. B-Line B3120 or B3110. Use pipe protection shield or saddles on insulated lines.
- E. Floor Supports
  - 1. Hot piping under 6 inch and all cold piping:
    - a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line B3093 and B3088T or B3090 and B3088. Screw or weld pipe saddle to appropriate base stand.
  - 2. Hot piping 6 inch and larger:
    - a. Adjustable Roller stand with base plate, B-Line B3117SL
    - b. Adjustable roller support and steel support sized for elevation, B-Line B3124
- F. Vertical Supports
  - 1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.
  - 2. Copper Tubing Supports
    - a. Size hangers to fit copper tubing outside diameters.
      - 1) Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
      - 2) Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
      - 3) Malleable iron split-ring hanger with eye socket, B-Line B3173CT with B3222.
      - 4) Adjustable steel clevis hanger, B-Line B3104CT.
    - b. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.
    - c. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.
- G. Plastic Pipe Supports
  - 1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.
  - 2. Supplementary Structural Supports
    - a. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Provide roll formed channels, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to Architect/Engineer for approval. Use clamps and fittings designed for use with the strut system.
- H. Pipe Supports Between Anchors and Pipe Expansion Loops
  - 1. Provide supports between pipe anchors designed to cause minimal resistance to piping movement. Provide roller hanger supports or slide plates between anchors.
  - 2. Provide supports near the L bends of pipe thermal expansion loops. No more than 12 inches from either side of the horizontal elbow.

### 2.03 UPPER ATTACHMENTS

- A. Beam Clamps
  - 1. Use beam clamps where piping is to be suspended from building steel. Select clamp type on the basis of load to be supported, and load configuration.
  - 2. Use center loaded beam clamps where specified. For steel clamps provide B-Line B3050, or B3055. For malleable iron or forged steel beam clamps with cross bolt provide B-Line B3054 or B3291-B3297 Series as required to fit beams.
- B. Concrete Inserts
  - 1. Use cast in place spot concrete inserts where applicable; either steel or malleable iron body, B-Line B2500 or B3014. Select spot inserts to allow for lateral adjustment and to

- have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
2. Use continuous concrete inserts where applicable. Provide 12 gauge channels, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with Styrofoam inserts and end caps with nail holes for attachment to forms. Provide continuous concrete inserts with a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.
  3. Provide Drop-In, shell type anchors with an internally threaded, all-steel shell with expansion cone insert and flush embedment lip. Manufacture anchors from plated carbon steel, 18-8 stainless steel and 316 stainless steel. Install anchors with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 specifications. Test anchors to ASTM E488 criteria and listed by ICC (formerly ICBO) and SBCCI. Provide anchors listed by the following agencies as required by the local building code: UL, FM. Select inserts to suit threaded hanger rod sizes, Redhead Multi-Set.

#### 2.04 ACCESSORIES

- A. Hanger Rods shall be threaded both ends or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.
- B. Provide shields that are 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.
- C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

#### 2.05 FINISHES

- A. Indoor Finishes
  1. Coat hangers and clamps for support of bare copper piping with copper colored epoxy paint, B-Line Dura-Copper®. Use additional PVC coating of the epoxy painted hanger where necessary.
  2. Zinc plate hangers for other than bare copper pipe in accordance with ASTM B633 OR provide an electro-deposited green epoxy finish, B-Line Dura-Green®.
  3. Provide pre-galvanized strut channels in accordance with ASTM A653 SS Grade 33 G90 or provide an electro-deposited green epoxy finish, B-Line Dura-Green®.
- B. Outdoor and Corrosive Area Finishes
  1. Hot dip galvanize hangers and struts located outdoors after fabrication in accordance with ASTM A123. Provide all hanger hardware as hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
  2. Provide hangers and strut manufactured of type 304 stainless steel with stainless steel hardware where located in corrosive areas.

### PART 3 - EXECUTION

#### 3.01 PIPE HANGERS AND SUPPORTS

- A. Adequately support pipe by pipe hanger and supports specified in PART 2 PRODUCTS. Allow for forces imposed by expansion joints, satisfy structural requirements and maintain proper clearances with respect to adjacent piping, equipment and structures. Size hangers for insulated pipes sized to accommodate insulation thickness.



- B. Keep the different types of hangers to a minimum and provide hangers that are neat, without complicated bolting and with the number of parts of each hanger and its anchor kept to a minimum.
- C. Make accurate weight balance calculations to determine the required supporting forces at each hanger or support location and the pipe weight load at each equipment connection.
- D. Provide pipe hangers capable of supporting the pipe in all conditions of operation selected to allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.
- E. Painted or shop prime all hangers and supports that are not galvanized.
- F. Support horizontal steel piping in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

| NOMINAL PIPE SIZE<br>(INCHES) | ROD DIAMETER<br>(INCHES) | MAXIMUM SPACING<br>(FEET) |
|-------------------------------|--------------------------|---------------------------|
| 1/2 to 1-1/4                  | 3/8                      | 6                         |
| 1-1/2                         | 3/8                      | 9                         |
| 2                             | 3/8                      | 10                        |
| 2-1/2                         | 1/2                      | 11                        |
| 3                             | 1/2                      | 12                        |
| 3-1/2                         | 1/2                      | 13                        |
| 4                             | 5/8                      | 14                        |
| 5                             | 5/8                      | 16                        |
| 6                             | 3/4                      | 17                        |
| 8                             | 3/4                      | 19                        |
| 10                            | 7/8                      | 22                        |
| 12                            | 7/8                      | 23                        |
| 14                            | 1                        | 25                        |
| 16                            | 1                        | 27                        |

- G. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

| NOMINAL PIPE SIZE<br>(INCHES) | ROD DIAMETER<br>(INCHES) | MAXIMUM SPACING<br>(FEET) |
|-------------------------------|--------------------------|---------------------------|
| 1/2 to 3/4                    | 3/8                      | 5                         |
| 1                             | 3/8                      | 6                         |
| 1-1/4                         | 3/8                      | 6                         |
| 1-1/2                         | 3/8                      | 8                         |
| 2                             | 3/8                      | 8                         |
| 2-1/2                         | 1/2                      | 9                         |
| 3                             | 1/2                      | 10                        |
| 3-1/2                         | 1/2                      | 11                        |
| 4                             | 1/2                      | 12                        |
| 5                             | 1/2                      | 13                        |
| 6                             | 5/8                      | 14                        |
| 8                             | 3/4                      | 16                        |

H. For grooved end steel pipe:

| NOMINAL PIPE SIZE<br>(INCHES) | MAXIMUM SPACING<br>(FEET) |
|-------------------------------|---------------------------|
| 1-1/2 and under               | 7                         |
| 2 through 4                   | 10                        |
| 5 and over                    | 12                        |

Do not leave any pipe length unsupported between any two coupling joints.

- I. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.
- J. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.
- K. Place a hanger within 12 inches of each horizontal elbow.
- L. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.
- M. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Space trapeze hangers according to the smallest pipe size, or install intermediate supports according to schedules in this Section.
- N. Do not support piping from other pipes, ductwork or other equipment that is not building structure.
- O. Where horizontal piping movements are greater than 1/2 inch, or where the hanger rod angularity from the vertical is greater than four degrees from the cold to hot position of the pipe, offset the hanger pipe and structural attachments in such a manner that the rod is vertical in the hot position.
- P. In any part of the building which is steel-framed, attach hangers to the building structural steel beams. Where hangers do not correspond with the building structural steel beams, provide supplemental steel members continuously welded or bolted to the building structural steel beams. Provide two (2) coats of primer on the supplemental steel. In any parts of the building which is a concrete structure, attach hangers to the concrete structure by installing anchors into the concrete.

### 3.02 CONCRETE INSERTS

- A. Secure pipe hangers attached to concrete structure and slabs with embedded inserts, anchor bolts or concrete fasteners. Use a safety factor of 5 in selection of all inserts and expansion bolts unless there are seismic requirements (See "Seismic Restraint" specification if applicable). In which case, the larger of the two loadings shall govern the design.
- B. Provide inserts for placement in formwork before concrete is poured.
- C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- D. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.

- E. E. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

**END OF SECTION 230529**

## PART 1 - GENERAL

## 1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Subbase for Concrete Pads: Section 310000.

## 1.02 REFERENCES

- A. Except as shown or specified otherwise, the Work of this Section shall conform to the requirements of Specifications for Structural Concrete for Buildings ACI 301-99 of the American Concrete Institute.

## 1.03 SUBMITTALS

- A. Submittals Package: Submit product data for design mix and materials for concrete specified below at the same time as a package.
- B. Shop Drawings: Placing drawings for bar reinforcement.
- C. Product Data:
  - 1. Concrete design mix with name and location of batching plant.
  - 2. Portland Cement: Brand and manufacturer's name.
  - 3. Fly Ash: Name and location of source, and DOT test numbers.
  - 4. Air-Entraining Admixture: Brand and manufacturer's name.
  - 5. Aggregates: Name and location of source, and NYS test numbers.
  - 6. Bonding Agent (Adhesive): Brand and manufacturer's name, and preparation and application instructions.
- D. Samples:
  - 1. Fabric Reinforcement: 8 inches square.
  - 2. Bar Supports: Full size.
- E. Quality Control Submittals:
  - 1. Certificates: Bar reinforcement manufacturer's certification that bar material conforms with ASTM A 615 and specified grade.

## 1.04 STORAGE

- A. Store materials as required to insure the preservation of their quality and fitness for the Work.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Anchor Bolts: Standard bolts, ASTM A 307, with lock washers and nuts.
- B. Steel Plates: ASTM A 36.
- C. Sleeves: Steel Pipe, Schedule 40, black, ASTM A 53.
- D. Steel Shims and Fillers: ASTM A 569.
- E. Reinforcement: Furnish the following unless otherwise indicated on the Drawings:
  - 1. Fabric Reinforcement: ASTM A 185 welded wire fabric, 6 x 6 - W2.9 x W2.9 fabricated into flat sheets unless otherwise indicated.
  - 2. Bar Reinforcement: ASTM A 615, Grade 60, deformed.

3. Metal Bar Supports: Galvanized or AISI Type 430 stainless steel, and without plastic tips.
  4. Tie Wire: Black annealed wire, 16 gage minimum.
- F. Fly Ash: ASTM C 618, including Table 1A (except for footnote A), Class F except that loss on ignition shall not exceed 4.0 percent.
- G. Bonding Agent (Adhesive): Epoxy-resin-base bonding system, Type II, complying with ASTM C 881. Grade and class as required by conditions of use.
- H. Cement Grout: Portland cement and clean natural sand mixed at a ratio of 1.0 part cement to 3.0 parts sand, with only the minimum amount of water required for placement and hydration.
- I. Dowels: ASTM A 36 steel bars 1/2 inch in diameter by 5 inches long, unless otherwise indicated on the Drawings.

## 2.02 PROPORTIONING OF CONCRETE MIXES

- A. Compressive Strength: Minimum 4000 psi.
- B. Weight: Normal.
- C. Durability: Concrete shall be air-entrained. Design air content shall be 6 percent by volume, with an allowable tolerance of plus or minus 1.5 percent for total air content. Entrained air shall be provided by use of an approved air-entraining admixture. Air-entrained cement shall not be used.
- D. Slump: Between 2 inches and 4 inches.
- E. Admixtures: Do not use admixtures in concrete unless specified or approved in writing by the Director.
- F. Selection of Proportions: Concrete proportions shall be established on the basis of previous field experience or laboratory trial batches, unless otherwise approved in writing by the Director. Proportion mix with a minimum cement content of 611 pounds per cubic yard for 4000 psi concrete.
1. Optional Material: Fly ash may be substituted for (Portland) cement in normal weight concrete up to a maximum of 15 percent by weight of the required minimum (Portland) cement. If fly ash is incorporated in a concrete design mix, make necessary adjustments to the design mix to compensate for the use of fly ash as a partial replacement for (Portland) cement.
  2. Adjustments shall include the required increase in air-entraining admixture to provide the specified air content.

## 2.03 FABRICATION OF ANCHOR BOLT ASSEMBLIES

- A. Bolts: Diameter 1/8 inch less than the bolt holes in the equipment supports and length equal to the depth of the pad minus 1 inch plus the additional length required to provide full thread through nuts after shims, equipment, and washers are in place.
- B. Sleeves: Diameter 1/2 inch larger than the bolt diameter and length as required to extend from the head of the bolt to the top of the pad.
- C. Plates: 3 x 3 x 1/4 inch steel plate.
- D. Weld a plate to the head end of a bolt. Center the bolt in a sleeve and tack-weld the sleeve to the plate.

## PART 3 - EXECUTION

## 3.01 EXAMINATION AND PREPARATION

- A. Concrete materials, reinforcement, forms, and earth which will be in contact with fresh concrete shall be free from frost at the time of concrete placement.

## 3.02 BONDING TO EXISTING CONCRETE SLABS

- A. Where more than one pad is required for a single piece of equipment, install 2 dowels in existing slab for each pad. Drill existing slab as required to install dowels 3 inches into the existing concrete. Grout dowels in the drilled holes.
- B. Prior to placing concrete, thoroughly roughen and clean existing concrete slab. Saturate existing concrete surface with clean water. Immediately prior to depositing concrete for pad, apply a coat of cement grout over the existing damp concrete or allow existing concrete to dry and apply bonding agent (adhesive) over the existing concrete in accordance with manufacturer's printed instructions.

## 3.03 INSTALLING ANCHOR BOLTS AND SLEEVES

- A. Install anchor bolts (with sleeves) for all bolt holes in equipment supports.
- B. Accurately position and securely support anchor bolts and sleeves prior to placing concrete. Support head of bolt 1 inch above bottom of pad. Temporarily close open end of sleeves to prevent entry of concrete.
- C. Grout anchor bolts in sleeves with cement grout or approved shrink-resistant grout after final positioning.

## 3.04 REINFORCING

- A. Except where other reinforcement is shown on the Drawings, install welded wire fabric at mid-depth of each pad, extending to 1 inch from perimeter of pad.

## 3.05 FINISHES

- A. Formed Surfaces: Provide a smooth rubbed finish, with rounded or chamfered external corners, on all concrete surfaces exposed to view.
- B. Unformed Surfaces: Provide a troweled finish on top surface of pads.

**END OF SECTION 230549**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This Section describes the marking and identification materials for identifying mechanical equipment, ductwork and piping systems.
- B. Mark and identify all mechanical equipment, ductwork and piping systems described herein, and as shown and specified in the Contract Documents.

## 1.02 REFERENCES

- A. ANSI A13.1 - Scheme for the Identification of Piping Systems.
- B. Z53.1 - Safety Color Code for Marking Physical Hazards.
- C. OSHA 29 CFR 1910 - Subpart J, General Environmental Controls

## 1.03 SUBMITTALS

- A. Identification Scheme - Submit scheme of identification codes.
- B. Steam Trap Schedule - Submit steam trap schedules listing proposed steam trap number, location, type, sizes and service.
- C. Valve Schedules - Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Samples - Submit samples of tags, attachments, labeled and identified.
- E. Equipment Schedules - Submit mechanical equipment schedules, listing proposed equipment numbers, and their location and function.
- F. Product Data: Provide manufacturers catalog literature for each product required.

## PART 2 - PRODUCTS

## 2.01 APPROVED MANUFACTURERS

- A. Seton
- B. Bunting
- C. W.H. Brady Company

## 2.02 VALVE TAGS

- A. Provide valve tags for all valves installed for this project. Valve tags shall be constructed of brass with stamped letters and service designation tag size minimum 1-1/2 inches (38 mm) diameter with smooth edges, brass S hook.
- B. Valve tags shall be permanently stamped and marked with a service designation, normal valve position, and an identifying number as large as possible. Each valve shall have a separate and distinct number coordinated with the service designations shown on the Drawings and the Owners existing valve numbering system. Coordinate with the Architect/Engineer and Owner before finalizing the valve tag numbering system.

### 2.03 PIPE MARKERS

- A. All accessible piping installed indoors for this project, insulated and uninsulated shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. "Accessible" piping shall include exposed piping, and piping located above lay-in ceilings. Markers shall include system name, flow arrow, and color code and pipe diameter.
- B. All piping installed outdoors for this project, insulated and uninsulated, shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. The marker shall be printed with weather-resistant ink.
- C. Where pipes are too small or not readily accessible for application of pipe markers, a brass identification tag at least 1 ½ inches in diameter, with depressed ½ inch high black letters and numerals, shall be securely fastened at locations specified for pipe markers.
- D. See pipe marker schedule for size requirements of pipe markers.

### 2.04 MECHANICAL EQUIPMENT MARKERS

- A. Identify all mechanical equipment, bare or insulated, installed in the rooms or on the roof, by means of lettered and numbered nameplate (not stenciled) identifying the equipment and service. Refer to the Drawings for equipment identifications. Nameplates shall be aluminum with permanent 1 ½ inch high white letters on a black background, mechanically affixed and installed in a readily visible location on the equipment. Coordinate the final equipment designation with the Owner.
- B. In addition to markers, all mechanical equipment shall be furnished with the manufacturer's identification plate showing the name of equipment, manufacturer's name and address, date of purchase, model number and performance data.

### 2.05 DUCT WORK IDENTIFICATION

- A. Provide full air distribution system identification at each side of a wall penetration, in a mechanical room, at all changes in direction and at no more than 50 foot intervals. Provide arrows identifying direction of flow.
- B. Fire damper or Smoke damper access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch in height reading: SMOKE DAMPER or FIRE DAMPER.
- C. Identification shall be preprinted labels.
- D. Letter Size: 1-1/2 inches in height.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Apply piping system markers and valve tags in the following locations:
  - 1. Adjacent to each valve and fitting.
  - 2. At each branch location and riser take-off
  - 3. At each side of a pipe passage through floors, walls, ceiling and partitions.
  - 4. At each pipe passage to and from underground areas.



5. Every 20 feet on all horizontal and vertical pipe runs.
- B. Provide arrow markers showing direction of flow incorporated into or adjacent to each piping system marker. Use double-headed arrows if flow is in both directions.
- C. Apply all piping system markers where view is unobstructed; markers and legends shall be clearly visible from operating positions.
- D. Apply all tags and piping system markers in accordance with the manufacturer's instructions. Do not attach tags to valve handle such that the normal or emergency operation of the valve will be hindered.

### 3.02 VALVE CHART

- A. Provide valve and steam trap chart identifying each valve's and steam trap's number, size of valve and service.
- B. Frame the chart and locate the schedule in the Mechanical Equipment Room. (Aluminum Frame with plastic window).
- C. Provide a compact disc that has the valve and steam trap chart schedule in a spreadsheet format. The spreadsheet software to be used for the schedule shall be identified by the Owner.

### 3.03 LAY IN CEILING TILES AND ACCESS DOORS

- A. Provide a lettered and numbered nameplate for each access door indicating the mechanical equipment that the door provides access too.

### 3.04 SCHEDULES

- A. Pipe Marker Letter Size Schedule:

| <b>Outside diameter of<br/>insulation or pipe<br/>Inches</b> | <b>Letter height<br/>Inches</b> | <b>Color field<br/>Inches</b> |
|--------------------------------------------------------------|---------------------------------|-------------------------------|
| 3/4 to 1-1/4                                                 | 1/2                             | 8                             |
| 1-1/2 to 2                                                   | 3/4                             | 8                             |
| 2-1/2 to 6                                                   | 1 - 1/4                         | 12                            |
| 8 to 10                                                      | 2 - 1/2                         | 24                            |
| Over 10                                                      | 3 - 1/2                         | 24                            |

**END OF SECTION 230555**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section specifies requirements for testing, adjusting, and balancing of all air and hydronic fluid distribution systems, including the equipment and devices associated with each system.
- B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

## 1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions and Division 1 Specification Sections, govern the work of this section.

## 1.03 SUBMITTALS

- A. Submit proof that the testing, adjusting and balancing agency meets the requirements of Section 1.04 "Quality Assurance", and all other specified requirements.
- B. Prior to performing the work, submit sample blank forms of the test reports that will be submitted by the entity performing work of this Section, indicating all data and parameters included.
- C. Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
  - 1. Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
  - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit two complete sets of final reports.
    - a. Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Enclose the report contents in a 3-ring binder. Divide the contents into the below listed divisions, separating them by divider tabs with titles descriptive of the contents:
      - 1) General Information and Summary.
      - 2) Air Systems.
      - 3) Hydronic Systems.
    - b. Report Contents: Provide the following minimum information, forms and data:
      - 1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the seal and name, address, telephone number and signature of the Agency's responsible certified Test and Balance Engineer.

Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

- 2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.
- c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.
- d. Existing Systems: Where existing systems are to be added to or modified include in the report results of operational tests taken prior to modifications including but not limited to existing fan and pump curves, pressure readings and flow measurements. Include in the report copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications and, where existing equipment is retained, operating points after system balance. Where terminals are adjusted or modified include terminal performance curves/data and final readings.

#### 1.04 QUALITY ASSURANCE

- A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.
- B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).
- C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
  1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
  3. National Environmental Balancing Bureau (NEBB)
  4. Associated Air Balance Council (AABC)
- B. Set the air delivery or intake of each diffuser, grille and register to be as designed or within five percent of the air flow rates shown on the Drawings.
- C. Set the fan air flow rate and static pressure rise across the fan to be within 10 percent above the design value at design speed.

### 1.06 JOB CONDITIONS

- A. Require the testing and balancing specialist to review his work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.
- B. Furnish and install balancing dampers, pressure taps, gauges, valves, and other components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.
- C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers and control valves to operate as required.

### 1.07 GENERAL

- A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.
- B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.
- C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

## PART 2 - PRODUCTS

NOT USED.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
- B. Obtain copies of approved shop drawings of all air handling and hydronic equipment, air outlets (supply, return and exhaust), manual valves, automatic valves and the temperature control diagrams, including intended sequence of operations.
- C. Existing Systems: Where existing systems are to be added to or modified perform operational tests prior to modifications including but not limited to existing fans and pumps curves, pressure readings and flow measurements.
  - 1. Obtain copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications. Where terminal units are to be adjusted or modified obtain performance data for these units.
- D. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.

- E. Examine the air systems to see that they are free from obstructions. Determine that all dampers and registers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.
- F. Examine the hydronic systems to see that they are free from abnormal obstructions, and that all piping, valves and equipment have been properly made fully operational. Determine that all equipment and control systems are performing correctly by functional testing.
- G. Where existing systems are to be modified or added to ensure that all strainers and filters are clean and any operational problems that will prevent system balance have been brought to the attention of the Owner and repaired.

### 3.02 TESTING, ADJUSTING AND BALANCING

- A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.
- B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the system in proper working condition and pay all expenses for all subsequent tests which are necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.
- C. Test all packaged equipment in strict accordance with the equipment manufacturer's requirements.
- D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.
- E. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.
- G. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.
- H. Perform tests and compile test data for all air systems and hydronic systems.
- I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems, and a schematic diagram for location of balancing valves, flow indicators, equipment, and devices for hydronic systems.
- J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.
- K. Air Systems

Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:

1. Test, record and adjust fan rpm to design requirements.
2. Test and record motor full load amperes.
3. Make a pitot tube traverse of main supply ducts and obtain design flow rate at fans.

4. Test and record system static pressure, velocity pressure and total pressure.
5. Test and adjust system for design supply, transfer and return air flow rate.
6. Test and adjust system for minimum and maximum design flow rates of outside air.
7. Test and record return air temperatures.
8. Test and record coil and fan leaving air temperatures.
9. Adjust all main supply, return, relief, and exhaust air ducts to proper design flow rate.
10. Adjust all zones to proper design flow rate for supply, return, transfer, relief and exhaust air.
11. Test and adjust each diffuser, grille and register.
12. Identify each grille, diffuser and register as to location and area on the schematic diagram.
13. Identify and list in the final report size, type and manufacturer of diffusers, grilles and registers and all tested equipment. Use manufacturer's data on all equipment to make required calculations for testing, adjusting and balancing. Include design required velocity and test resultant velocity, required flow rate and test resultant flow rate after adjustment as part of readings and tests of diffusers, grilles and registers.
14. Adjust all diffusers, grilles and registers to minimize drafts in all areas.
15. Permanently mark all dampers after air balance is complete so that they can be restored to their correct position, if disturbed later.
16. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

L. Hydronic Systems

1. Perform the testing, adjusting and balancing of hydronic systems in accordance with the detailed procedures outlined in the referenced standards; and including but not limited to the following:
  - a. Preliminary procedure prior to balancing:
    - 1) Examine water in system and determine if water has been treated and cleaned.
    - 2) Check expansion tank to determine that it is not air bound and the system is completely full of water.
    - 3) Purge all air vents of water systems, check automatic air vents and determine if they are operating properly. Repair or replace any air vents that are not operating properly.
    - 4) Coordinate with control manufacturer for required cooling and heating temperature controls and corresponding, automatic valve operation settings.
    - 5) Open all normally open valves to full open position. Set automatic valves to full coil flow.
    - 6) Complete air balance before final water balance begins.
    - 7) Check water pumps for pump rotation and for proper flow rate delivery against manufacturer's pump curves.
    - 8) Set all balancing valves for required flow delivery at mains and branch mains to cooling and heating elements.
    - 9) Upon completion of flow readings and adjustments of balancing valves, mark all settings and record data, so that they can be restored to their correct "balanced" position, if disturbed later.
  - b. Include the following as part of the final balancing:
    - 1) After required cooling and heating temperature controls and automatic valve operation settings are made, recheck pump flow requirements and readjust system as required.
    - 2) Record pressure drop through coil at set flow rate of coil for full cooling and for full heating. Set pressure drop across bypass valve to match coil pressure drop.
    - 3) Record and check the following items at each cooling and heating element:
    - 4) Inlet water temperatures and static pressure at connections.
    - 5) Leaving water temperatures and pressure drop of each coil.
    - 6) Flow rate through coil with control valve stroked manually wide open.

- 7) Record operating suction and discharge pressures of each pump and final total dynamic head and rated amperage versus actual amperage of pump motors.
- 8) Record entering and leaving water temperatures and flow through all equipment and devices.
- 9) Check and record all flow rates at all locations in the piping system with flow meters.
- 10) Upon completion of air and hydronic systems testing, patch insulation, ductwork and housings, using materials identical to those removed.
- 11) Perform final testing, adjusting and balancing during summer season for air conditioning systems and during winter season for heating systems, including operation when outside conditions are within 5 degrees F wet bulb temperature of maximum summer design condition, and within 10 degrees F dry bulb temperature of minimum winter design condition.
- 12) Retest, adjust, and balance systems subsequent to system modifications. Resubmit test results.

**END OF SECTION 230594**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section describes the insulation, jackets and accessories for piping as scheduled in Part 3 of this Section and as shown on the Drawings.

## 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping
- B. Section 078413 - Through Penetration Firestopping for HVAC Systems
- C. Section 079201 - Non Fire Rated Sleeves and Seals
- D. Section 232000 - Pipe, Valves, and Fittings
- E. Section 232300 - Refrigerant Piping

## 1.03 REFERENCES

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 255 - Surface Burning Characteristics of Building Materials.
- B. Greenguard
- C. 2020 New York State Energy Conservation Code
- D. 2020 New York State Mechanical Code
- E. Underwriters Laboratories, Inc. (UL):
  - 1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- F. American Society for Testing and Materials (ASTM):
  - 1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
  - 4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
  - 5. ASTM C335 - Standard Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
  - 6. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - 7. ASTM C518 - Standard Test Method for Steady-State Heat Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - 8. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
  - 9. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
  - 10. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
  - 11. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation
  - 12. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - 13. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.



14. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.
15. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
16. ASTM C 610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
17. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
18. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
20. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
21. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Standard Test Method for Water Vapor Transmission of Materials.

#### 1.04 DEFINITIONS

- A. Greenguard: Greenguard Environmental Institute
- B. IAQ: Indoor Air Quality
- C. EPA: Environmental Protection AgencyA
- D. WHO: World Health Organization
- E. ASJ: All Service Jacket
- F. SSL: Self-Sealing Lap
- G. FSK: Foil-Scrim-Kraft; jacketing
- H. PSK: Poly-Scrim-Kraft; jacketing
- I. PVC: Polyvinyl Chloride
- J. FRP: Fiberglass Reinforced Plastic
- K. Cold Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.
- L. Hot Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 105 degrees F or higher.

#### 1.05 SUBMITTALS

- A. Product data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

## 1.06 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer: Company specializing in manufacturing products specified with minimum 3 years documented experience.
  - 2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.
- B. Materials:
  - 1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
  - 2. Insulation for duct, pipe and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
- B. Follow manufacturer's recommended storage and handling practices.

## 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product (tapes, adhesives, mastics, cements, insulation, etc.).
- B. Maintain temperature before, during, and after installation for a minimum of 24 hours.
- C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.
- D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site.

## PART 2 - PRODUCTS

## 2.01 FIBER GLASS INSULATION

- A. Approved Manufacturers:
  - 1. Knauf Insulation
  - 2. Johns Manville Corporation
  - 3. Owens Corning Corporation
  - 4. CertainTeed Corporation
- B. Fiber glass insulation meeting ASTM C547, ASTM C585, and ASTM C795; rigid molded, noncombustible.
- C. Factory applied vapor barrier jacket: ASJ/SSL conforming to ASTM C1136 Type I and ASTM E96, secured with self-sealing longitudinal laps and butt strips.

## 2.02 FIBER GLASS INSULATION JACKETS AND ACCESSORIES

- A. Field-Applied Jackets and Fitting Covers

1. PVC - 25/50 or Indoor/Outdoor, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system consisting of pre-molded, high-impact PVC materials with fiber glass inserts. Approved Manufacturer: Proto Corporation.
    - a. Thickness: 10 mil.
    - b. Closures: stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.
  2. ASTM B209 formed aluminum, 0.016-inch thick in smooth, corrugated, or embossed finish with factory-applied moisture barrier. Approved Manufacturer: Childers.
    - a. Overlap: 2-inch minimum.
    - b. Fittings: 0.016-inch thick die-shaped with factory-applied moisture barrier.
    - c. Metal jacket bands: 3/8-inch wide, 0.015-inch thick aluminum or 0.010-inch thick stainless steel.
  3. ASTM A666, Type <<302; 304; 316>> stainless Steel, 0.010-inch thick in smooth, corrugated, or embossed finish with factory-applied moisture barrier. Approved Manufacturer: Childers.
    - a. Overlap: 2-inch minimum.
    - b. Fittings: 0.016-inch thick die-shaped with factory-applied moisture barrier.
    - c. Metal jacket bands: 3/8-inch wide, 0.010-inch thick stainless steel.
  4. Laminated Self-Adhesive Water and Weather Seals - Permanent acrylic self-adhesive System; weather resistant, high puncture and tear resistance; meeting or exceeding requirements of UL 723; applied in strict accordance with manufacturers' recommendations.
- B. Fitting Insulation
1. Pre-formed fiberglass, preformed perlite, mitered fiberglass, mitered perlite or calcium silicate in lieu of PVC systems. Protect fittings with field-applied fitting covers.
- C. Tapes
1. Vapor barrier type, self-sealing, non-corrosive, fire-retardant. Approved Manufacturer: Compac Corporation

## 2.03 ELASTOMERIC INSULATION

- A. Approved Manufacturers:
1. Armacell LLC
  2. K-Flex USA, Inc.
- B. Flexible, tubular (Type 1) or sheet/roll form (Type 2) closed-cell elastomeric insulation complying with ASTM C534 <<Grade 1 - Standard (temperature range -297°F to 220°F); Grade 2 - High Temperature (to 350°F); Grade 3 - Contains no halogens>>; use molded tubular material wherever possible.

## 2.04 ELASTOMERIC INSULATION ACCESSORIES

- A. Adhesives:
1. Air dried, waterproof vapor barrier contact adhesive, compatible with insulation for joining of seams and butt joints.
- B. Finishes:
1. Provide a weather and UV resistant protective finish for outdoor applications in accordance with the manufacturer's recommendations.

## 2.05 CELLULAR GLASS INSULATION

- A. Approved Manufacturers:
1. Pittsburgh Corning Corporation

- B. Cellular glass insulation meeting ASTM C552, Type II.

## 2.06 HIGH DENSITY JACKETED INSULATION INSERTS FOR HANGERS AND SUPPORTS

- A. For use with Fiberglass Insulation:
  - 1. Cold Service Piping:
    - a. Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75 degrees F, minimum compressive strength of 125 psi.
  - 2. Hot Service Piping:
    - a. Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300 degrees F; ASTM C 533.
    - b. Perlite: Minimum density 12 pcf, K of 0.60 at 300 degrees F; ASTM C 610.
- B. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify that all piping is tested and approved prior to insulation installation.
- B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

### 3.02 INSTALLATION (GENERAL)

- A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.
- B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.
- C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.
- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. For hot piping conveying fluids <<140°F>> or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over <<140°F>>, insulate flanges and unions at equipment.
- G. Maintain continuous pipe insulation through walls, ceiling or floor openings, or sleeves except where firestop or firesafing materials are required.
- H. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.
- I. Insulate fittings, valves and flanges using premolded covers with precut insulation inserts.
- J. Insulate piping using insulation of type and thickness scheduled in this Section.

- K. Install metal shields between hangers or supports and the piping insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Fabricate inserts to be of equal thickness to the adjacent insulation and vapor seal as required. Insulation inserts shall be no less than the following lengths:

|                  |          |
|------------------|----------|
| 1½" to 2½" IPS   | 10" long |
| 3" to 6" IPS     | 12" long |
| 8" to 10" IPS    | 16" long |
| 12" and over IPS | 22" long |

- L. Pipe exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor) to be finished with PVC jacket and fitting covers, aluminum jacket, or stainless steel jacket.
- M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- N. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with <<aluminum; stainless steel>> jacket with seams located on bottom side of horizontal piping. Coordinate insulation installation with heat-tracing installation and testing. Insulate piping after tracing or heat distribution tape has been installed and tested for continuity.

### 3.03 INSTALLATION (FIBER GLASS)

- A. Provide a continuous vapor retarder on piping operating below ambient temperatures. Seal all joints, seams and fittings.
- B. Firmly butt and secure ends with appropriate butt-strip material. On high-temperature piping, double layering with staggered joints when recommended by the insulation manufacturer. When double layering, the inner layer should not be jacketed.
- C. Insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- D. Insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. Exterior Applications:
1. Jacket piping and fittings exposed to the elements using aluminum or stainless steel jackets with a factory applied moisture barrier. Hold firmly in place with a friction type Z lock or a minimum 2" overlap joint. Seal all joints completely along the longitudinal seam and install so as to shed water. Seal all circumferential joints by use of preformed butt strips; minimum 2" wide or a minimum 2" overlap. Overlap butt strips to the adjacent

jacketing a minimum ½-inch and completely weather seal. Install a 6" to 10" unsealed slide joint every 25 to 30 lineal feet to allow for the thermal expansion of the pipe and jacketing. In addition, apply a thin bead of silicone grease in the overlap to prevent water migration while allowing the joint to slide. Install an unsealed slide joint where distance between fittings exceeds 8 lineal feet.

2. Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with <<aluminum; stainless steel>> jacket with seams located on bottom side of horizontal piping.

F. Cold Piping Insulation:

1. On below freezing applications and in high abuse areas protect the ASJ jacket with a PVC vapor retarding outer jacket. Seal exposed ends of the insulation with a vapor retarder mastic installed per the manufacturer's recommendations. Apply vapor seals at butt joints at every fourth pipe section joint and at each fitting to isolate any water incursion.
2. On chilled water systems operating in conditions of: RH of 90% and above, follow the same guidelines as described above for below freezing applications.

### 3.04 INSTALLATION (ELASTOMERIC)

A. Piping:

1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, slide unslit sections over the open ends of piping or tubing. Adhere and seal all seams and butt joints using adhesive.
2. Push insulation onto the pipe, never pull. Stretching of insulation may result in open seams and joints.
3. Tape the ends of the tubing before slipping the insulation over the new pipes to prevent dust from entering the pipe.
4. Clean cut all edges. Do not leave rough or jagged edges of the insulation. Use proper tools such as sharp non-serrated knives.
5. On cold piping, adhere insulation directly to the piping at the high end of the run using a two-inch strip of adhesive on the inner diameter of the insulation and on the pipe. Coat all exposed end cuts of the insulation with adhesive. Adhere all penetrations through the insulation and termination to the substrate to prevent condensation migration.
6. Use sheet insulation on all pipes larger than 6-inch diameter. Do not stretch insulation around the pipe. On pipes larger than 12-inch diameter, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24-inch diameter, completely adhere insulation.
7. Stagger seams when applying multiple layers of insulation.

B. Valves, Flanges and Fittings:

1. Insulate all fittings with the same insulation thickness as the adjacent piping. Adhere all seams and mitered joints with adhesive. Sleeve screwed fittings and adhere with a minimum 1" overlap onto the adjacent insulation.
2. Insulate valves, flanges, strainers, and Victaulic couplings using donuts covered with sheet or oversized tubular insulation.

C. Hangers:

1. Support piping system using high density inserts with sufficient compressive strength. Apply elastomeric foam insulation with the same or greater thickness than the pipe insulation to pipe supports. Seal all joints with adhesive.
2. Standard and split hangers - Insulate piping supported by ring hangers with the same insulation thickness as the adjacent pipe. Seal all seams and butt joints with adhesive. Sleeve ring hangers using oversized tubular insulation. On cold piping, extend insulation up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.

3. Clevis hangers or other pipe support systems - Install saddles under all insulated lines at unistrut clamps, clevis hangers, or locations where insulation may be compressed due to the weight of the pipe. Insert and adhere wooden dowels or blocks of a thickness equal to the insulation to the insulation between the pipe and the saddle.
4. Pre-insulated pipe hangers can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. Adhere a pair of non-skid pads to the clamps to minimize the movement. In addition, to prevent loosening of the clamps, use an antivibratory fastener, such as a nylon-locking nut.

D. Exterior Applications:

1. Paint all outdoor exposed piping with two coats of UV resistant finish. Prior to applying the finish, wipe the insulation with denatured alcohol. Do not tint the finish.
2. Locate seams for all outdoor exposed piping on the lower half of the pipe.

### 3.05 PIPING INSULATION MATERIAL SCHEDULE

| SYSTEM OR SERVICE      | LOCATION | INSULATION TYPE | JACKET             |
|------------------------|----------|-----------------|--------------------|
| HEATING HOT WATER      | INSIDE   | FIBER GLASS     | ALL SERVICE JACKET |
| HEATING HOT WATER      | INSIDE   | FIBER GLASS     | ALL SERVICE JACKET |
| HEATING HOT WATER      | OUTSIDE  | FIBER GLASS     | ALUMINUM JACKET    |
| HEATING HOT WATER      | OUTSIDE  | FIBER GLASS     | ALUMINUM JACKET    |
| CONDENSATE DRAINS      | INSIDE   | ELASTOMERIC     |                    |
| HVAC REFRIGERANT LINES | INSIDE   | ELASTOMERIC     |                    |
| HVAC REFRIGERANT LINES | OUTSIDE  | ELASTOMERIC     | EXTERIOR COATING   |

### 3.06 MINIMUM PIPING INSULATION THICKNESS (IN.)

| FLUID<br>OPERATING<br>TEMP<br>RANGE (°F) | SYSTEMS<br>IN TEMP<br>RANGE | INSULATION<br>CONDUCTIVITY                |                             | NOMINAL PIPE OR TUBE SIZE<br>(IN.) |                    |                    |                |     |
|------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------|------------------------------------|--------------------|--------------------|----------------|-----|
|                                          |                             | CONDUCTIVITY<br>BTU*IN./(H*SQ.<br>FT.*°F) | MEAN<br>RATING<br>TEMP (°F) | <1                                 | 1 TO<br><<br>1-1/2 | 1-1/2<br>TO<br>< 4 | 4<br>TO<br>< 8 | =8  |
| > 350                                    |                             | 0.32-0.34                                 | 250                         | 4.5                                | 5.0                | 5.0                | 5.0            | 5.0 |
| 251-350                                  |                             | 0.29-0.32                                 | 200                         | 3.0                                | 4.0                | 4.5                | 4.5            | 4.5 |
| 201-250                                  |                             | 0.27-0.30                                 | 150                         | 2.5                                | 2.5                | 2.5                | 3.0            | 3.0 |
| 141-200                                  |                             | 0.25-0.29                                 | 125                         | 1.5                                | 1.5                | 2.0                | 2.0            | 2.0 |
| 105-140                                  |                             | 0.21-0.28                                 | 100                         | 1.0                                | 1.0                | 1.5                | 1.5            | 1.5 |
| 40-60                                    |                             | 0.21-0.27                                 | 75                          | 0.5                                | 0.5                | 1.0                | 1.0            | 1.0 |
| < 40                                     |                             | 0.20-0.26                                 | 50                          | 0.5                                | 1.0                | 1.0                | 1.0            | 1.5 |

**END OF SECTION 230700**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section describes the insulation, jackets and insulating accessories for sheet metal ductwork as scheduled in Part 3 of this Section and as shown on the Drawings.

## 1.02 REFERENCES

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 255 - Surface Burning Characteristics of Building Materials.
- B. Greenguard
- C. 2020 New York State Energy Conservation Code
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
- E. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- F. Underwriters Laboratories, Inc. (UL):
  - 1. UL 723 - Surface Burning Characteristics of Building Materials.
- G. American Society for Testing and Materials (ASTM):
  - 1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
  - 2. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
  - 3. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - 4. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
  - 5. ASTM C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
  - 6. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
  - 7. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
  - 8. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
  - 9. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
  - 10. ASTM E84 - Surface Burning Characteristics of Building Materials.
  - 11. ASTM E96 - Water Vapor Transmission of Materials.

## 1.03 DEFINITIONS

- A. Greenguard: Greenguard Environmental Institute
- B. IAQ: Indoor Air Quality
- C. EPA: Environmental Protection Agency
- D. WHO: World Health Organization
- E. ASJ: All Service Jacket
- F. SSL: Self-Sealing Lap
- G. FSK: Foil-Scrim-Kraft; jacketing



- H. PSK: Poly-Scrim-Kraft; jacketing
- I. PVC: Polyvinyl Chloride
- J. FRP: Fiberglass Reinforced Plastic
- K. Cold Piping/Ductwork/Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.

#### 1.04 SUBMITTALS

- A. Product data: To include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.
- B. Provide samples and mock-ups of systems as required.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements, and insulation materials.
- B. Follow manufacturer's recommended handling practices.
- C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.
- D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site. Discard air handling insulation used in the air stream if exposed to water.

#### 1.06 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer: Company specializing in manufacturing Products specified with minimum 3 years documented experience.
  - 2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.
- B. Materials:
  - 1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
  - 2. Certify insulation for duct, pipe and equipment for above grade exposed to weather outside building as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

### PART 2 - PRODUCTS

#### 2.01 FIBERGLASS DUCT WRAP

- A. Flexible Fiber Glass Blanket meeting ASTM C 553 Types I, II and III, and ASTM C 1290; Greenguard compliant.
- B. Factory Applied Vapor Retarder Jacket: FSK or PSK conforming to ASTM C 1136 Type II.

- C. Maximum service temperature of 250° F (Faced) or 350° F (Unfaced).
- D. Density:
  - 1. Concealed areas: Minimum 0.75 PCF.
  - 2. Exposed areas: Minimum 1.0 PCF.
- E. Approved Products:
  - 1. Friendly Feel Duct Wrap by Knauf

#### 2.02 FIBERGLASS RIGID BOARD

- A. Rigid Fiber Glass Board insulation meeting ASTM C 612 Type IA and IB.
- B. Mean temperature by ASTM C 177 and a maximum service temperature of 450° F.
- C. Factory Applied Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or PSK conforming to ASTM C 1136 Type II.
- D. Density:
  - 1. Concealed areas: Minimum 3 PCF
  - 2. Exposed areas: Minimum 6 PCF
- E. Approved Products:
  - 1. Insulation Board by Knauf

#### 2.03 INTERNAL DUCT LINING

- A. Conforming to ASTM C 1071 Type 1 and NFPA 90A & 90B.
- B. Noise Reduction Coefficient (NRC): ASTM C 423 Type A Mounting, 0.40 or higher for ½" product, 0.60 or higher for 1" product.
- C. Rated for a maximum air velocity of 6000 Feet per minute.
- D. Approved Products:
  - 1. Textile Duct Liner with Hydrosshield® Technology by Knauf.

#### 2.04 FIBERGLASS INSULATION ACCESSORIES

- A. Aluminum Jacket - 0.016-inch (0.406 mm) thick in smooth, corrugated, or embossed finish with factory applied moisture barrier. Overlap 2-inch (50 mm) minimum.
- B. Laminated Self-Adhesive Water and Weather Seals - apply per manufacturers' recommendations.
- C. Tapes - Vapor barrier type, self-sealing, non-corrosive, fire-retardant. Approved Manufacturer: Compac Corporation
- D. Adhesives - Approved Manufacturer: Foster
- E. Mastic - Approved Manufacturer: Foster
- F. Vapor Barrier Coating - Approved Manufacturer: Foster

## 2.05 SHEET WATERPROOFING MEMBRANE

- A. Prefabricated, self-adhering, sheet-type waterproofing membrane shall be FlexClad-400 by MFM Building Products Corp. or approved equal.
- B. Description:
  - 1. Top Layer: Stucco-embossed, UV-resistant aluminum weathering surface.
  - 2. Middle Layer: Multiple layers of high-density cross-linked polymer film.
  - 3. Bottom Layer: Uniform layer of rubberized asphalt adhesive, protected by disposable silicone release paper.
- C. Color: As selected by Architect/Engineer.
- D. Material Thickness: ASTM D 1970, 40 Mils Nominal
- E. Flexibility: ASTM D 1970, Pass.
- F. Vapor Permeance: ASTM E 96, 0 perms.
- G. Nail Sealability: ASTM D 1970, Pass.
- H. Heat Aging: ASTM D 794, Pass.
- I. Tear Resistance: ASTM D 1424, Average: 660 grams.
- J. Ultimate Elongation MD: ASTM D 412, 434 percent.
- K. Ultimate Elongation CMD: ASTM D 412, 246 percent.
- L. Low Temperature Flexibility: 1,000,000 Cycles at -10 Degrees F, 1,200 Cycles at -20 Degrees F, No cracking.
- M. Flame Spread Index: ASTM E 84, 0.
- N. Smoke Density Index: ASTM E 84, 5.
- O. Wind-Driven Rain: SFBC TAS-110-95, 100 mph, No leakage or failure.
- P. UV Stability: Excellent.
- Q. Accessories: MFM Spray Adhesive

## 2.06 FIRE RATED BLANKET (KITCHEN HOOD EXHAUST DUCT)

- A. Thermal Material: 2192°F rated core blanket, manufactured from calcium magnesium silicate.
- B. Fully encapsulated thermal material in fiberglass reinforced aluminum/polypropylene scrip (FSP).
  - 1. Encapsulation FSP marked with UL Classification Mark.
  - 2. Encapsulation FSP marked with ICC-ES report number ESR 2213.
  - 3. Collars supplied in 6 inch wide by 25 feet long rolls.
- C. Product Characteristics:
  - 1. Thickness: 1-1/2 inch.
  - 2. Nominal Density: 6 pcf.

3. R-Value: 7.35 per layer when tested in accordance with ASTM C 518 at 75°F.
4. Flame Spread: <25 when tested in accordance with ASTM E 84.
5. Smoke Spread: <50 when tested in accordance with ASTM E 84.

D. Approved Products:

1. FireMaster FastWrap XL by Thermal Ceramics.

## 2.07 FIRE RATED BLANKET INSULATION ACCESSORIES

- A. Glass Filament Tape: Minimum  $\frac{3}{4}$  inch wide - used to temporarily secure blanket until permanent attachment using steel banding and/or steel insulation pins.
- B. Aluminum Foil Tape: Minimum 3 inches used to seal cut edges.
- C. Carbon Steel or Stainless Strapping Material Minimum:  $\frac{1}{2}$  inch wide and 0.015 inch thick.
- D. Steel Insulation Pins: Minimum 12 gage, length sufficient to penetrate through duct wrap insulation.
- E. Insulation Clips: Galvanized steel, minimum 1-1/2 inches round or square.
- F. Through Penetration Firestop Sealants:
  1. Packing Material: Remove encapsulation material from wrap, use core blanket (white) as penetration packing material.
  2. Firestop sealants per applicable building code report and/or laboratory design listings.
- G. Grease and HVAC Duct Access Doors:
  1. Thermal Ceramics FastDoor XL Access doors

## 2.08 LOUVER BLANK OFF PANELS

- A. Facing: 0.032 inch thick aluminum on both sides.
- B. Perimeter Frame: 0.050 inch thick-formed aluminum channels.
- C. Core: Expanded polystyrene (EPS), R value of 8

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify that all ductwork is tested and approved prior to insulation installation.
- B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

### 3.02 DUCTWORK REQUIRING INSULATION

- A. Insulate Ductwork as specified in the DUCTWORK INSULATION SCHEDULE.
  1. Insulate any additional ductwork or plenums indicated to be insulated on the Drawings.

### 3.03 INSTALLATION (GENERAL)

- A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.

- B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.
- C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.
- D. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.
- E. Install ductwork hanger supports on the outside of the insulation. Where vertical ducts are supported to the building structure, insulate the ductwork supports to prevent condensation.
- F. Insulate ductwork using insulation of the type and thickness scheduled at the end of this Section.
- G. If specified insulation board thickness does not cover ductwork standing seams and reinforcing angles, insulate them by adhering a grooved strip of fiberglass board with a thickness at least 1 ½ inches greater than the height of the seam or angle covered over the standing seam or angle.

#### 3.04 FIBERGLASS INTERNAL DUCT LINING

- A. Apply Duct Lining in strict accordance with the latest edition of SMACNA's "HVAC Duct Construction Standard Metal & Flexible" and NAIMA's "Fibrous Glass Duct Liner Standard".
- B. Select length of mechanical fasteners in accordance with the manufacturer's recommendation as listed on each product. Install mechanical fasteners perpendicular to the duct surface, and such that the pin does not compress the liner more than 2% relative to the nominal thickness of the insulation.
- C. Adhesive shall conform to ASTM C 916. Apply adhesive to the sheet metal with a 90% minimum coverage. Coat all exposed edges of the duct liner with the same adhesive. Repair all rips and tears using an adhesive that conforms to ASTM C 916.
- D. Cover all internal duct areas with duct liner. Firmly butt transverse joints with no gaps and coat with adhesive. Overlap and compress longitudinal corner joints.
- E. When air velocities are 4000 to 6000 FPM, apply metal nosing to all upstream transverse edges to additionally secure the insulation.

#### 3.05 FIBERGLASS WRAP INSULATION

- A. Apply external duct wrap per insulation schedule even where internally lined.
- B. Install Duct Wrap to obtain specified R-value using a maximum compression of 25%.
- C. Firmly butt all joints.
- D. Overlap the longitudinal seam of the vapor retarder a minimum of 2 inches.
- E. Where vapor retarder performance is required, repair all penetrations and damage to the facing using pressure-sensitive foil tape or mastic prior to system startup.
- F. Use pressure-sensitive foil tapes a minimum 3 inches wide and apply by moving pressure using a squeegee or other appropriate sealing tool.

- G. Additionally secure Duct Wrap to the bottom of rectangular ductwork over 24 inches wide using mechanical fasteners on 18-inch centers. Do not over-compress insulation during installation.
- H. Overlap unfaced Duct Wrap a minimum of 2 inches and fasten using 4-inch to 6-inch nails or skewers spaced 4 inches apart, or secured with a wire/banding system. Do not damage the Duct Wrap.

### 3.06 FIBERGLASS BOARD INSULATION

- A. Fit insulation by scoring, cutting and mitering to fit the contour of the ductwork.
- B. Attach insulation to ductwork in thickness scheduled by brushing adhesive uniformly on all sides of ductwork covering 100 percent of ductwork surface. Press insulation into place, making complete contact with adhesive. Butt edges of insulation board tightly together without gaps.
- C. Additionally, hold insulation in place by impaling on pins welded to all four sides of the ductwork. Locate and weld pins a minimum 12 inch on center with a minimum of 2 rows per side of duct and no less than 3 inches from the edges of the ductwork. Secure insulation to pins with 1 inch diameter hold-down washers. As an alternate to welded pins, provide "Gripnail" mechanical surface fasteners by Gripnail Corporation using pneumatic hammer designed for this work.
- D. Seal all joints, seams, breaks, and punctures in facing with adhesive and cover with 3 inch wide sealing tape. Flash supports with vapor barrier coating.
- E. For rectangular ducts and plenums exposed to weather, pitch ductwork or insulation board minimum ¼ inch per foot to prevent rainwater from accumulating on top of duct or plenum. Cover insulation board with Sheet Waterproofing Membrane.

### 3.07 SHEET WATERPROOFING MEMBRANE

- A. Surface Preparation:
  - 1. Prepare surfaces in accordance with manufacturer's instructions.
  - 2. Ensure tops of ducts have sufficient slope to eliminate ponding water.
  - 3. Ensure bottoms of ducts have foil-faced rigid insulation boards installed.
  - 4. Ensure surfaces are clean and dry.
  - 5. Remove dirt, dust, oil, grease, hand oils, processing lubricants, moisture, frost, and other contaminants that could adversely affect adhesion of waterproofing membrane.
  - 6. Prime metal, concrete, and masonry surfaces with primers approved by waterproofing membrane manufacturer.
- B. Application:
  - 1. Apply waterproofing membrane in accordance with manufacturer's instructions on all exterior insulated ductwork and at locations indicated on the Drawings.
  - 2. Apply membrane to clean, dry, primed metal ductwork and foil-faced rigid insulation boards. Do not apply over wet or non-rigid insulation.
  - 3. Apply membrane in accordance with manufacturer's air, material, and surface temperature requirements.
  - 4. Apply firm, uniform pressure with hand roller to entire membrane to ensure proper adhesion. Concentrate pressure at seams and on underside of ductwork.
  - 5. Apply membrane to ducts in accordance with manufacturer's instructions.
  - 6. Apply membrane shingle fashion to shed water over, not against laps.
  - 7. Do not terminate membrane on bottom of duct.
  - 8. Apply minimum 3-inch laps and minimum 6-inch end laps for ductwork applications.
  - 9. Embed membrane to bottom of ducts over 24 inches wide in light continuous layer of adhesive applied to insulation face.

10. Apply membrane to bottom of insulated ducts over 36 inches wide using mechanical attachment, in addition to adhesive, in accordance with manufacturer's instructions. Install pints on 12-inch centers with rows staggered.
11. Apply adhesive to areas where special adhesion requirements exist, including duct bottoms, flashings, transitions, joints, elbows, valves, tees, and other fittings.

C. Protection:

1. Protect applied waterproofing membrane and fabric flexible duct connections from damage during construction.

### 3.08 FIRE RATED BLANKET

- A. Install insulation in direct contact with the ductwork in accordance with the manufacturer's instructions and referenced standards.
- B. Install 2 layers of FireMaster FastWrap XL for zero clearance and a 1 and 2 hour commercial kitchen grease duct application per ASTM E 2336.
  1. Consult with manufacturer of proposed substitutions for required thickness to maintain a 2-hr fire rating with a zero clearance to combustibles.
- C. Install 1 layer of FireMaster FastWrap XL for a 1 and 2 hour air ventilation duct enclosure per ISO 6944-1985.
- D. Where exhaust duct penetrates firewall install ductwrap as per the manufacturer's instructions for through penetrations.
- E. Locate doors on 20-foot centers on straight runs of ductwork and at each change of direction. Position doors on the side of duct a minimum of 1.5 inches above the bottom of the duct.

### 3.09 DUCTWORK INSULATION SCHEDULE

A. Fiber Glass Insulation Schedule:

| Ductwork System                                                                                             | Type                            | Minimum R-Value |
|-------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|
| Supply Ducts and Plenums, Concealed                                                                         | Fiberglass Duct Wrap            | 6               |
| Return Ducts and Plenums, Concealed                                                                         | Fiberglass Duct Wrap            | 6               |
| Supply and Return Ducts and Plenums, Exposed in the Space Served                                            | Uninsulated                     | NA              |
| Supply and Return Ducts and Plenums, Exposed Other Than in the Space Served                                 | Fiberglass Rigid Board          | 6               |
| Outdoor Air Intake Ducts, Indoors                                                                           | Fiberglass Rigid Board          | 6               |
| Ducts Located Outdoors                                                                                      | Fiberglass Rigid Board          | 8               |
| Unused Portions of Louvers                                                                                  | Louver Blank Off Panels         | As Specified    |
| Ductwork 20 Feet Upstream and Downstream of Air Handling Units and Supply and Return Fans, Located Indoors  | Fiberglass Internal Duct Lining | Note 1          |
| Ductwork 20 Feet Upstream and Downstream of Air Handling Units and Supply and Return Fans, Located Outdoors | Fiberglass Internal Duct Lining | Note 1          |
| General Exhaust Ducts Except as Noted                                                                       | Uninsulated                     | NA              |

NOTE 1 - Ductwork to be provided with 1-inch internal lining in addition to externally applied insulation in accordance with the table above.

**END OF SECTION 230719**



## PART 1 - GENERAL

## 1.01 DESCRIPTION

- A. General provisions and other mechanical systems are specified in other Sections of Division 23.
- B. Commissioning is an ongoing process and shall be performed throughout construction. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 shall be familiar with the commissioning plan issued by the Commissioning Authority (CA) as it applies to the work of Division 23 and shall execute all commissioning responsibilities assigned to them in the Contract Documents. The Contractors should also review Specifications Section 019113 for additional information.
- C. Commissioning shall conclude with the completion of all required deferred testing, training and system documentation as specified and required to ensure the proper operation of the mechanical equipment and systems provided by this Division.
- D. This Section covers mechanical systems commissioning, as required to demonstrate that the equipment and systems of Division 23 are ready for safe and satisfactory operation, as defined by project documents. Commissioning shall include, but shall not be limited to, identification of piping and equipment, cleaning, lubrication, start-up, check-out, and testing, adjusting, and balancing of systems, preparation of equipment and systems documentation and of maintenance and operation manuals, Owner training, and preparation of record drawings.
- E. This section does not alter the commissioning requirements indicated in Section 019113 of the General Commissioning Requirements. This section is to help define/supplement the requirements of Section 019113 where applicable.

## 1.02 QUALITY ASSURANCE

- A. The mechanical contractor shall identify a mechanical commissioning supervisor. The mechanical commissioning supervisor should have a minimum of ten years experience in mechanical contracting. The mechanical commissioning supervisor shall become familiar with the design intent and the requirements of the commissioning process as defined in this Section. The mechanical commissioning supervisor shall attend all commissioning meetings and coordinate the commissioning schedule as outlined by the CA. The mechanical commissioning supervisor shall assist the CA in coordinating and executing the required commissioning activities.

## 1.03 MECHANICAL, PLUMBING, AND FIRE PROTECTION CONTRACTOR RESPONSIBILITIES

- A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.
- B. The mechanical commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the mechanical contractor and associated subcontractors are identified in this Section and in other Sections of this Division.
- C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as per section 019113.
- D. Mechanical commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:
  - 1. Construction Phase

- a. The Contractor shall attend a Commissioning Scoping meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and may increase in frequency to weekly during the start-up, pre-functional and functional testing phases. The Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scoping meeting and other commissioning meetings, as appropriate, during the construction process.
- b. The Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.
- c. The Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.
- d. The Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.
- e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.
- f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.
- g. The Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.
- h. The Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
- i. The CA shall prepare the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
- j. Contractor shall prepare a preliminary schedule for Division 23 commissioning activities, to include pipe and duct system testing, flushing and cleaning, equipment start-up, and TAB start and completion, for use by the CA and shall update the schedule as appropriate. CA will assist in providing expected time durations for Cx activities.
- k. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction. Mechanical equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.
- l. The Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical-related portions

of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.

- m. The Contractor shall perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CA.
- n. The Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air or water related systems.
- o. The CA shall generate the functional testing procedure and record to the mechanical contractor. The mechanical contractor shall review and provide support to the functional testing process. Contractor shall operate boilers, pumps, etc., and systems in accordance with the CA requirements, open and close disconnects and switch normal and emergency power requirements as directed by the CA and the functional testing procedures.
- p. The Contractor shall report in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.
  - 1) Acceptance Phase. The Contractor shall assist and cooperate with the CA in the commissioning process by:
    - (a) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
    - (b) For a given area, have all required pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
    - (c) Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
    - (d) Provide a TAB representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
    - (e) Including cost of sheaves and belts that may be required to obtain required equipment performance, as measured by the test and balance effort.
    - (f) Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
    - (g) Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
    - (h) Installing a P/T plug at each water sensor that is an input point to the Control System.
    - (i) Providing skilled technicians to execute starting and operation of equipment.
    - (j) The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
    - (k) The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, DX and hot water systems to generate loading strategies) during the functional testing.
    - (l) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.

- (m) Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
  - (n) Maintain on site redline as built drawings and produce final "As-built" drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
  - (o) Provide specified training of the Owner's operating personnel in accordance with the CA's overview and outline.
  - (p) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
  - (q) Provide updated diagrammatical logic for all TAB adjustments to the system.
- 2) Warranty Period. During the warranty period, the Contractor shall:
- (a) Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.
  - (b) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

#### 1.04 TAB CONTRACTOR RESPONSIBILITIES

- A. Six weeks prior to the starting of the T&B, submit to the CA, the qualifications of the site technician(s) for the project, including three (3) names of contractors and facility managers of recent projects on which the personnel were in charge. The Owner and CA will approve the site technician for this job.
- B. Three months prior to the start of the TAB, submit a TAB plan and approach for each system. The plan shall be reviewed by the TAB and the CA for review and approval. The submitted plan shall include:
- 1. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and Contractors to sufficiently understand the design intent for each system.
  - 2. An explanation of the intended use of the building control system.
  - 3. All field check-out sheets and logs to be used that lists each piece of equipment to be tested adjusted and balanced with the data cells to be gathered for each.
  - 4. Final test report forms to be used during this process:
    - a. Detailed step by step procedures for TAB work for each system and issue: terminal flow calibration; diffuser proportioning; branch and submain proportioning; total flow calculations; and rechecking diversity issues.
    - b. List all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of each of the test procedures, parameters and formulas to be used.
    - c. Details of how total flow will be determined (Air: sum of terminal flows via BMS calibrated readings or via hood, pitot tube or flow stations). Details of how total water flow will be determined (Water: pump curves, circuit setters, flow station, ultrasonic, etc.).
    - d. The identification and types of measurement instruments to be used and their most recent calibration date.
    - e. Specific procedures that will ensure that both air and watersides will be operating at there lowest possible pressure at the point where the system will operate.
    - f. Confirmation that the TAB contractor understands the outside air ventilation criteria under all conditions and how this will be measured during normal, economizer and unoccupied conditions.
    - g. Details of how building static, room static and exhaust fan capacity will be checked.

- h. Proposed selection points for traverse measurement locations on the as-built documents. Review the placement of the HVAC measurement devices for proper straight runs and accuracy.
- i. Submit a plan for testing and checking the fume hood system exhaust requirements.
- j. Plan for formal progress reports including scope and frequency.
- k. Plan for formal deficiency reports including scope and frequency.
  - 1) TAB contractor shall attend commissioning meetings as directed by the CA and the general contractor.
  - 2) TAB contractor shall communicate in writing to the controls contractor and the CA all setpoint and parameter changes made or problems and discrepancies identified during the TAB process that would affect the control loop system set-up and operation.
  - 3) Submit written report of discrepancies, deficit or uncompleted work by others, contract interpretation requests and list of completed tests to the CA at least once per week.
  - 4) After the TAB plan is accepted and two-weeks prior to TAB work, the contractor shall conduct a pre-balancing conference. Prior to the pre-balancing conference, the TAB contractor shall inspect the system readiness for testing and balancing. The TAB contractor shall prepare a list of deficiencies and uncompleted work that will affect the TAB process. This list shall be submitted to the CA and the general contractor.
  - 5) The TAB contractor shall review the projected schedule and provide, in writing, to the CA and CM any delays in the schedule and what items will require completion prior to the TAB work.
  - 6) The CA agent shall conduct independent verification of 10% of air and water end-devices for acceptance after the TAB contractor states in writing that they are complete with Testing & Balancing. The TAB contractor shall provide a mechanic to assist the CA in this verification and shall include this in the scope and price of the Work.
  - 7) The TAB agent shall submit the TAB report to the CA for his review and comment. All data contained shall be re-verified in the field by the CA. A minimum of ten percent of the airflow readings shall be verified by the CA using his own equipment. All selection points shall be random. Total airflow shall be verified on all mains in the supply and the exhaust ducts.

#### 1.05 CONTROL CONTRACTOR RESPONSIBILITIES

- A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.
- B. The controls commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the controls contractor and associated subcontractors are identified in this Section and in other Sections of this Division.
- C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as per section 019113.
- D. Controls commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:
  - 1. Construction Phase
    - a. Contractor shall attend a Commissioning Scope meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and increase in frequency to weekly during the start-up, pre-functional and functional testing phases. Contractor shall assure that all subcontractors who have commissioning

- responsibilities attend the Commissioning Scope meeting and other commissioning meetings, as appropriate, during the construction process.
- b. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.
  - c. Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.
  - d. Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; points listing; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.
  - e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.
  - f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.
  - g. Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.
  - h. Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
  - i. CA shall prepare for the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
  - j. Controls contractor shall prepare a preliminary schedule for their commissioning activities, to include wiring, instrument installation, calibration, point-to-point verification, sequence of operation testing and emergency operating procedural testing for use by the CA and shall update the schedule as appropriate. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction.
  - k. Controls instrument and equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.
  - l. Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical/controls-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.
  - m. Contractor shall perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.

- n. Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Point-to-point verification shall be completed with discrepancies and problems remedied before functional testing of the respective controls related systems.
- o. The CA shall generate the functional testing procedure and record to the controls contractor. The controls contractor shall review and provide support to the functional testing process. Contractor shall aid in operating boilers, pumps, etc., and systems in accordance with the CA requirements, turn on and off normal and emergency power requirements as directed by the CA and the functional testing procedures.
- p. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.
  - 1) Acceptance Phase. Contractor shall assist and cooperate with the CA in the commissioning process by:
    - (a) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
    - (b) For a given area, have all required, pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
    - (c) Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
    - (d) Provide a controls representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
    - (e) Providing skilled technicians to execute starting and operation of equipment.
    - (f) The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
    - (g) The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, chilled water and hot water systems to generate loading strategies) during the functional testing.
    - (h) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
    - (i) Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
    - (j) Maintain on site redline as built drawings and produce final "As-built" drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
    - (k) Provide specified training of the Owner's operating personnel in accordance with the CA's overview and outline.
    - (l) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
    - (m) Provide a detailed marked up drawings of all the instruments and their installed location (P&ID) for instruments and components.
  - 2) Warranty Period. During the warranty period, the Contractor shall:
    - (a) Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.

- (b) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

## PART 2 - PRODUCTS

### 2.01 SYSTEMS TO BE COMMISSIONED

- A. The following are systems to be commissioned:
  - 1. Hot Water Boilers (2 Units - BL-1, BL-2)
  - 2. Dedicated Outdoor Air System (1 Unit - DOAS-1)
  - 3. Rooftop Units (1 Unit - RTU-208)
  - 4. Variable Refrigerant Flow Evaporators, Branch Boxes and Condensers (24 Units - EU-X, FCU-X, BC-X, CU-X)
  - 5. Exhaust Fans (8 units - GX-X, TX-X, ERXF-1)
  - 6. Kitchen Hood System (2 Units - KX-1, MAU-1)
  - 7. Hot Water Pumps (6 Units - HHWP-1,2,3,4,5&6)
  - 8. Cabinet Unit Heaters (3 Units - CUH-A,B,126)
  - 9. High Volume Low Speed Fans (3 Units - HVLS-1,2,3)
  - 10. Air Outlets (7 types, X Units – Test 10%)
  - 11. ATC System (test functionality as it has been modified by systems above)

### 2.02 TEST EQUIPMENT

- A. All standard testing equipment required to the mechanical portion startup, initial checkout shall be provided by the Contractor responsible for the equipment or system being tested. This includes TAB and controls verification.
- B. The CA shall perform their own system verification and performance check-out. The CA shall provide their own calibrated equipment as required for this testing.
- C. All testing equipment associated with functional performance verification and point-to-point required by the CA shall be the responsibility of the CA. All testing equipment associated with the control's contractor point-to-point verification shall be the responsibility of the control's contractor.
- D. Special equipment, tools and instruments (only available from vendor or specific to a piece of equipment) required for the functional testing of that equipment, according to the requirements of the contract documents and the functional test procedures shall be provided to the CA by the installing contractor and shall become the property of the Owner at project completion as indicated in the specification.
- E. Proprietary test equipment and software required by any manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide test equipment, demonstrate its use and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon successful completion of the commissioning process as required in the specifications.

## PART 3 - EXECUTION

### 3.01 SUBMITTALS

- A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1 and Section 019113.



## 3.02 STARTUP PLAN AND PREFUNCTIONAL TESTING

- A. The mechanical contractor and associated subcontractors shall be responsible for the installation of complete systems and sub-systems, fully functional, meeting the design objectives of the Contract Documents. Contractor shall follow the approved start-up, initial checkout, and pre-functional testing procedures. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility to the CA or Owner.
- B. Pre-functional testing as directed and performed by the contractor shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional performance testing may proceed without delays. Sampling strategies shall not be used for pre-functional testing. The pre-functional testing for all equipment and subsystems of a given system shall be successfully completed and documented prior to functional performance testing of the system. The mechanical contractor and sub-contractors shall sign off on the CA's pre-functional test sheets that they are complete and the system is ready. The CA will verify and conduct their own independent verification and start-up in parallel to the Contractor's verification. Any deficiencies identified during this process shall be noted and reviewed by the Contractors. Start-up and functional testing shall not proceed until all the deficiencies are corrected and verified by the CA.
- C. The following procedures shall apply to all equipment and systems to be commissioned.
  - 1. Start-up and Initial Checkout Plan. The contractor shall develop the detailed start-up and pre-functional testing plans for all equipment to be reviewed by the CA. The primary role of the CA in this process shall be to review the installation for construction completeness and ensure that all components have been installed as per the design documents. Only when pre-functional testing is complete and signed off by all Contractors, shall the Contractor start-up the equipment. Equipment and systems to be commissioned are identified in this Section Part 2.
  - 2. The start-up and initial checkout plan shall consist of the following as a minimum:
    - a. The manufacturer's standard written start-up and checkout procedures copied from the installation manuals and manufacturer's normally used field checkout sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
    - b. First-run checklist for equipment, to include:
      - 1) Equipment properly set.
      - 2) Alignment of shafts and couplings.
      - 3) Adjustment of vibration isolators.
      - 4) Piping and equipment properly connected.
      - 5) Completion of initial lubrication procedures.
      - 6) Clean filters in place, as appropriate.
      - 7) Wiring properly connected.
      - 8) Electrical overload relays appropriate for load.
      - 9) Electrical accessories properly installed and adjusted.
      - 10) Controls, safeties, and time switches properly calibrated and set-up.
      - 11) Verification of direction of motor rotation after final electrical connections by jogging motor.
      - 12) Measurements of ampere draw of electric motors and comparison with nameplate rating and with overload heater ratings.
      - 13) The Contractor shall submit the start-up reports to the CA for review.
- D. The CA shall review and approve the procedures and the format for documenting them, noting any procedures that need to be added.

- E. Two weeks prior or startup, the Contractor shall schedule start-up and checkout with the Owner and CA. The execution of the start-up and checkout shall be directed and performed by the Contractor, in accordance with manufacturer's published procedures and with the approved procedures. The CA may be present for the Contractor's required startup and checkout of all systems and equipment to be commissioned.
- F. Sensor Calibration. Calibration of all sensors shall be included as part of the pre-functional testing and listed on the appropriate test checklists and reports, according to the specified procedures and accuracies for the devices and systems being tested.
- G. All contractor responsible start-up, checkout forms shall be completed and submitted to the CA for review.

### 3.03 FUNCTIONAL PERFORMANCE TESTS

- A. Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just individual components) under full, part and seasonal requirements. Systems are tested under various loads and control sequences, such as low cooling and heating loads, component failures, unoccupied modes, fire alarm, etc. The systems are run through all the control sequences of operation and components are verified to be responding as the design intent and documents. FPV shall include; testing all sequences of operations, verification of system capacity, generating simulated signals to simulate sensor values, conducting simulated conditions to tests all loads and verify system performance during all conditions of operation and verifying design intent. In addition, each system shall be tested through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Proper responses such as power failures, freeze conditions, low-oil pressures, equipment failures, etc. shall also be tested. The CA develops the functional test sheets and procedures in sequential written form, coordinates the testing, conducts the testing and documents the testing. Each contractor is required to supply personnel to assist during the functional performance testing where applicable.
- B. No system, equipment or component thereof shall be tested until the Contractor and the CM has certified, in writing, that the system, equipment and / or components are complete, have been tested, adjusted and balanced and are ready for validating and performance testing. FPV is scheduled by the CA after the pre-functional testing requirements are complete and signed-off by the CM and the CA. FPV will not be conducted until a written notice of completion by the CM confirming that the system is ready for FPV. The air balancing and water balancing must be complete and the controls must be debugged prior to the performance verification.
- C. Functional testing shall be conducted by the CA. Functional testing may not proceed until the systems have been properly installed, started-up and all deficiencies have been corrected.
- D. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion shall not relieve the Contractor from fully completing the system, including all pre-functional checklists.
- E. The Contractor shall provide personnel to operate the systems while functional performance testing is commencing. This shall include but not be limited to; starting and stopping of systems, opening and closing valves to create false loads on the system (with the capabilities of the existing system) and allowing the CA to manipulate the building automation systems to modulate the system requirements.
- F. The Contractor shall review the commissioning functional performance testing procedure supplied by the CA. After functional testing commences, the Contractor and the CA shall sign

the functional test record and provide the owner and the CM a copy to review. All deficiencies either corrected in the field or outstanding shall be documented on the functional test forms for review by all parties.

- G. All functional testing must be completed and approved by the CA and the owner before the project will be considered substantially complete.

### 3.04 DEFERRED TESTING

- A. **Deferred Testing.** The Contractor shall be available to assist in seasonal testing (Summer, Winter and Intermediate), tests delayed until weather or other conditions until building construction is completed, required building occupancy or loading, or other conditions are suitable for the demonstration of equipment or system's performance, as specified. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible. Deferred testing shall be executed, documented and deficiencies corrected as specified herein for functional performance testing. Any adjustments or corrections to the O&M manuals and "As built" documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

### 3.05 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

- A. The CA shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully. The testing form and any outstanding deficiencies shall be provided to the CM/Owner within two days of test completion. The CA shall review the Contractor's startup testing reports and shall submit either a non-compliance report or an approval form to the Contractor. The CA shall work with the Contractor and others as necessary, to correct and retest deficiencies or uncompleted items. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report with a Statement of Correction on the original non-compliance report. When all requirements are satisfactorily completed, the CA shall recommend approval of the startup and pre-functional testing of each system and schedule the functional testing of the equipment or system.
- B. As functional performance testing progresses and a deficiency is identified, the CA shall discuss the issue with the executing contractor and the commissioning team.
  - 1. When there is no dispute of the deficiency and the Contractor accepts responsibility for correcting it, the CA shall document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the Contractor during the functional performance testing, at the discretion of the CA. Every effort shall be made or expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort.
  - 2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the non-compliance form, certifying that the equipment is ready to be retested, and return the form to the CA. The CA shall schedule the retest of the equipment or system involved.
  - 3. If there is a dispute about an identified deficiency, the CA shall document the deficiency and the Contractor's response, and provide a copy to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. When the dispute resolution has been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and returns the form to the CA. The CA shall schedule the retest of the equipment or system involved. Final interpretive authority shall be the A/E. Final acceptance authority shall be the Owner.

- C. During the functional performance testing of multiple units of similar equipment, the CA will test all of the installed equipment and components identified. If, under such a testing procedure, three or more identical pieces of equipment (size along does not constitute difference) fail to perform to the requirements of the Contract Documents (mechanically or substantively) due to manufacturing or installation defects not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CA. In such a case, the Contractor shall provide the CA with the following:
1. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CA within two weeks of the original notice.
  2. Within two weeks of the original notification, the Contractor shall provide the CA and the A/E a signed and dated, written explanation of the problem, cause of failures, etc., and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solution shall not be for less than the specification requirements of the original installation.
  3. When approved, two examples of the proposed solution shall be installed by the Contractor and the CA shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the CA shall recommend the acceptance or disapproval of the proposed solution to the Owner.
  4. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair all identical items, at their expenses and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week of approval of the proposed solution.
  5. Cost of Retesting
    - a. The cost for CA and/or Owner personnel to conduct the retesting of a functional performance testing requirements necessitated because a specific pre-functional or start-up test item, reported to have been successfully completed, but found to be incomplete or faulty, shall be the responsibility of the Contractor.
    - b. For a deficiency identified during the functional testing, not related to any pre-functional checklist or start-up fault, the CA and Owner shall direct the retesting of the equipment once at "no charge" for their time. However, all costs for any subsequent retesting shall be the responsibility of the Contractor.
    - c. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back-charges to the responsible party.

### 3.06 OPERATION AND MAINTENANCE (O&M) MANUALS

- A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications. A detailed listing of O&M requirements is listed in Section 019113.
- B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the CM for inclusion in the O&M manuals, according to this section and Section 019113, prior to the training of owner personnel.
- C. The CA shall receive a copy of the O&M manuals for review.
- D. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and diskettes, shall cover all mechanical systems. Documentation shall include the following: operations and maintenance documentation directory; emergency information; operating manual; emergency information; maintenance manual; test reports; and construction documents.

- E. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Owner and CA before systems start-up and commissioning, and shall be updated, revised and completed during, and at completion of, commissioning.

### 3.07 TRAINING OF OWNER PERSONNEL

- A. The mechanical commissioning supervisor shall be responsible for training coordination and scheduling of required training and for ensuring that all required training is completed. The CA shall oversee the content and adequacy of the training of Owner personnel.
- B. Prepare and submit a syllabus describing an overview of the program, describing how the program will be conducted, when and where meetings are to be held, names and company affiliations of lecturers, description of contents and outline for each lecture, and recommended reference material and outside reading. Obtain direction from the Owner on which operating personnel shall be instructed in each system. Proposed training schedules, materials, and lesson plans shall be submitted to the CA for review of the content and adequacy of the training of Owner personnel for commissioned equipment or systems.
- C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:
  - 1. Provide the CA with training plan one week before the planned training.
  - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
  - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment.
  - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
  - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise, as well as in-depth knowledge of all modes of operation of the specific piece of equipment, is required. More than one party may be required to execute the training.
  - 6. The controls contractor shall attend sessions other than the controls training, for each type of equipment controlled by the BAS, to discuss the interaction of the BAS as it relates to the equipment being discussed.
  - 7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

### 3.08 WRITTEN WORK PRODUCTS

- A. Written work products of Contractors shall consist of the start-up and initial checkout plan and the filled out start-up, initial checkout and pre-functional checklists.

**END OF SECTION 230800**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All work of this Division shall be coordinated and provided by the single Building Management System (BMS) Contractor.
- B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 23 Sections for details.
- C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
- D. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.02 BMS DESCRIPTION

- A. The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.
- B. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.
- C. Servers shall be used for the purpose of providing a location for extensive archiving of system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard data base platform: Microsoft SQL Server Express or Microsoft SQL Server as dictated elsewhere in this specification.
- D. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.
- E. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.
- F. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.
- G. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
  - 1. Operator information, alarm management and control functions.

2. Enterprise-level information and control access.
3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
4. Diagnostic monitoring and reporting of BMS functions.
5. Offsite monitoring and management access.
6. Energy management
7. Standard applications for terminal HVAC systems.
8. BACnet integration to the Variable Refrigerant Flow Equipment

### 1.03 QUALITY ASSURANCE

#### A. General

1. The Building Management System Contractor shall be a manufacturer-owned branch office of a recognized national manufacturer that is regularly engaged in the engineering, programming, installation and service of total integrated Building Management Systems.
2. Quality Management Program
  - a. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manager shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:
    - 1) Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
    - 2) Manage the financial aspects of the BMS Contract.
    - 3) Coordinate as necessary with other trades.
    - 4) Be responsible for the work and actions of the BMS workforce on site.

### 1.04 WORK BY OTHERS

- A. The demarcation of work and responsibilities between the BMS Contractor and other related trades shall be as outlined in the BMS RESPONSIBILITY MATRIX:

| WORK                                                                              | FURNISH         | INSTALL         | LOW VOLT. WIRING/TUBE | LINE POWER            |
|-----------------------------------------------------------------------------------|-----------------|-----------------|-----------------------|-----------------------|
| BMS low voltage wiring                                                            | BMS             | BMS             | BMS                   | N/A                   |
| BMS communications bus wiring                                                     | BMS             | BMS             | BMS                   | N/A                   |
| BMS conduits and raceway                                                          | BMS             | BMS             | BMS                   | BMS                   |
| Automatic dampers                                                                 | BMS             | HVAC Contractor | N/A                   | N/A                   |
| Automatic valves                                                                  | HVAC Contractor | HVAC Contractor | BMS                   | N/A                   |
| Pipe insertion devices and taps including thermowells, flow and pressure stations | BMS             | HVAC Contractor | BMS                   | BMS                   |
| BMS Current Switches                                                              | BMS             | BMS             | BMS                   | N/A                   |
| BMS Control Relays                                                                | BMS             | BMS             | BMS                   | N/A                   |
| All BMS Nodes, equipment, housings, enclosures and panels                         | BMS             | BMS             | BMS                   | Electrical Contractor |
| Packaged RTU Network Thermostats                                                  | BMS             | BMS             | BMS                   | Electrical Contractor |
| Packaged RTU factory-mounted controls                                             | HVAC Contractor | HVAC Contractor | HVAC Contractor       | Electrical Contractor |

### 1.05 SUBMITTALS

- A. Shop Drawings, Product Data, and Samples
  - 1. The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.
  - 2. Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.
  - 3. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.
  - 4. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
  - 5. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
  - 6. The BMS Contractor shall correct any errors or omissions noted in the first review.
  - 7. At a minimum, submit the following:
    - a. BMS network architecture diagrams including all nodes and interconnections.
    - b. Systems schematics, sequences and flow diagrams.
    - c. Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
    - d. Samples of Graphic Display screen types and associated menus.
    - e. Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
    - f. Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
    - g. Details of all BMS interfaces and connections to the work of other trades.
    - h. Product data sheets or marked catalog pages including part number, photo and description for all products including software.

### 1.06 RECORD DOCUMENTATION

- A. Operation and Maintenance Manuals
  - 1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the BMS provided:
    - a. Table of contents.
    - b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
    - c. Manufacturer's product data sheets or catalog pages for all products including software.
    - d. System Operator's manuals.
    - e. Archive copy of all site-specific databases and sequences.
    - f. BMS network diagrams.
    - g. Interfaces to all third-party products and work by other trades.
    - h. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the product data sheets. A logically organized



table of contents shall provide dynamic links to view and print all product data sheets.

Viewer software shall provide the ability to display, zoom, and search all documents.

2. On-Line documentation: After completion of all tests and adjustments the contractor shall provide a copy of all as-built information and product data to be installed on a customer designated computer workstation or server

#### 1.07 WARRANTY

- A. Standard Material and Labor Warranty:
  1. Provide a one-year labor and material warranty on the BMS.
  2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.
  3. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BMS Contractor's normal business hours.

### PART 2 - PRODUCTS

#### 2.01 LARGE GENERAL DESCRIPTION

- A. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.
- B. The Building Management System shall consist of the following:
  1. Standalone Network Automation Engine(s)
  2. Field Equipment Controller(s)
  3. Input/Output Module(s)
  4. Local Display Device(s)
  5. Distributed User Interface(s)
  6. Network processing, data storage and communications equipment
  7. Other components required for a complete and working BMS
  8. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
  9. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
    - a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
    - b. The System shall maintain all settings and overrides through a system reboot.
  10. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
  11. Acceptable Manufacturers
    - a. LG, MultiSITE
    - b. Johnson Controls, Metasys
    - c. Trane, Tracer

#### 2.02 BMS ARCHITECTURE

- A. Automation Network

1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
  2. The BMS shall network multiple user interface clients, automation engines, system controllers and application-specific controllers. Provide one (1) application and data system server for long term data storage that also permits up to five (5) simultaneous system users.
  3. All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
  4. Network Automation Engines (NAE) and Network Control Engines (NCE) shall reside on the automation network.
  5. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.
- B. Control Network
1. Network Automation Engines (NAE) and Network Control Engines (NCE) shall provide supervisory control over the control network and shall be capable of supporting both of the following communication protocols as required:
    - a. BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9
    - b. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
  2. The Network Engines shall be BACnet Testing Labs (BTL) certified and carry the BTL Label. The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
  3. Control networks shall provide either "Peer-to-Peer," Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
  4. DDC Controllers shall reside on the control network.
  5. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135. LonWorks is only acceptable for third party integration where the third party device is unable to communicate using BACnet protocol.
  6. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
  7. The PICS shall be submitted prior to contract award, when requested, as a condition of award. Otherwise, they shall be part of the project submittal package.
- C. Integration
1. BACnet Protocol Integration - BACnet
    - a. The neutral protocol used between systems shall be either BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2008 or BACnet MS/TP communicating at 38,400 baud.
    - b. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
    - c. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

## 2.03 USER INTERFACE

- A. Dedicated Web Based User Interface
1. The BMS Contractor shall provide and install on the maintenance manager's personal computer the ability for command entry, information management, network alarm management, and database management functions for the BMS. All real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines to facilitate greater fault tolerance and reliability.
  2. Dedicated User Interface Architecture - The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications

provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.

- a. Microsoft Internet Explorer for user interface functions
  - b. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions
  - c. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports
  - d. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries
3. Peripheral Hardware
- a. Reports printer:
    - 1) Printer Make - Hewlett Packard DeskJet
    - 2) Print Speed - 600 DPI Black, 300 DPI Color
    - 3) Buffer - 64 K Input Print Buffer
    - 4) Color Printing - Include Color Kit
- B. Distributed Web Based User Interface
1. All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.
  2. The software shall run on the Microsoft Internet Explorer (7.0 or higher) browser supporting the following functions:
    - a. Configuration
    - b. Commissioning
    - c. Data Archiving
    - d. Monitoring
    - e. Commanding
    - f. System Diagnostics
  3. Minimum hardware requirements:
    - a. 1GB RAM
    - b. 2.0 GHz Clock Speed Pentium 4 Microprocessor
    - c. 100 GB Hard Drive.
    - d. 1 Keyboard with 83 keys (minimum).
    - e. SVGA 1024x768 resolution display with 64K colors and 16 bit color depth
    - f. Mouse or other pointing device
- C. Site Management User Interface Application Components
1. Operator Interface
    - a. An integrated browser based client application shall be used as the user operator interface program.
    - b. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.
    - c. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
    - d. The user interface software shall provide help menus and instructions for each operation and/or application.
    - e. The system shall support customization of the UI configuration and a home page display for each operator.
    - f. The system shall support user preferences in the following screen presentations:
      - 1) Alarm
      - 2) Trend
      - 3) Display

- 4) Applications
- g. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
- h. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
  - 1) User access for selective information retrieval and control command execution
  - 2) Monitoring and reporting
  - 3) Alarm, non-normal, and return to normal condition annunciation
  - 4) Selective operator override and other control actions
  - 5) Information archiving, manipulation, formatting, display and reporting
  - 6) BMS internal performance supervision and diagnostics
  - 7) On-line access to user HELP menus
  - 8) On-line access to current BMS as-built records and documentation
  - 9) Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications
- i. The system shall support a list of application programs configured by the users that are called up by the following means:
  - 1) The Tools Menu
  - 2) Hyperlinks within the graphics displays
  - 3) Key sequences
- j. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.
2. Navigation Trees
  - a. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
  - b. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
  - c. The navigation trees shall be "dockable" to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.
3. Alarms
  - a. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
    - 1) Log date and time of alarm occurrence.
    - 2) Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.
    - 3) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
    - 4) Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
    - 5) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above.

Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

- 6) Any attribute of any object in the system may be designated to report an alarm.
- b. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.
- c. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined wav.files.
- d. The BMS shall annunciate application alarms at minimum, as required by Part 3.
4. Reports and Summaries
  - a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
    - 1) All points in the BMS
    - 2) All points in each BMS application
    - 3) All points in a specific controller
    - 4) All points in a user-defined group of points
    - 5) All points currently in alarm
    - 6) All points locked out
    - 7) All user defined and adjustable variables, schedules, interlocks and the like.
  - b. Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.
  - c. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
  - d. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.
5. Schedules
  - a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
    - 1) Weekly schedules
    - 2) Exception Schedules
    - 3) Monthly calendars
  - b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
  - c. It shall be possible to define one or more exception schedules for each schedule including references to calendars
  - d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
  - e. Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.
  - f. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.
  - g. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.
  - h. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history
6. Password

- a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.
  - b. Each user shall have the following: a user name (accept 24 characters minimum), a password (accept 12 characters minimum), and access levels.
  - c. The system shall allow each user to change his or her password at will.
  - d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
  - e. A minimum of six levels of access shall be supported individually or in any combination as follows:
    - 1) Level 1 = View Data
    - 2) Level 2 = Command
    - 3) Level 3 = Operator Overrides
    - 4) Level 4 = Database Modification
    - 5) Level 5 = Database Configuration
    - 6) Level 6 = All privileges, including Password Add/Modify
  - f. A minimum of 100 unique passwords shall be supported.
  - g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
  - h. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.
  - i. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.
7. Screen Manager
- a. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.
8. Dynamic Color Graphics
- a. The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.
  - b. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.
    - 1) The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.
  - c. Graphics runtime functions - A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:
    - 1) All graphics shall be fully scalable
    - 2) The graphics shall support a maintained aspect ratio.
    - 3) Multiple fonts shall be supported.
    - 4) Unique background shall be assignable on a per graphic basis.
    - 5) The color of all animations and values on displays shall indicate the status of the object attribute.
    - 6) Graphics that represent buildings or systems shall allow natural links and transitions between related detailed tabular views of data that compliment the graphic.

- d. Operation from graphics - It shall be possible to change values (setpoints) and states in system controlled equipment directly from the graphic.
- e. Floor Plan graphics - The user interface shall provide graphic applications that summarize conditions on a floor. Floor plan graphics shall indicate thermal comfort using dynamic colors to represent zone temperature deviations from zone setpoint(s). Floor plan graphics shall display overall metrics for each zone in the floor.
- f. Aliasing - Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.
- g. Graphic editing tool - A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.
  - 1) The graphic editing tool shall provide a library of standard HVAC equipment, floor plan, lighting, security and network symbols.
  - 2) The graphic editing tool shall provide for the creation and positioning of library symbols by dragging from tool bars or drop-downs and positioning where required.
  - 3) The graphics editing tool shall permit the importing of AutoCAD drawings for use in the system.
  - 4) The graphic editing tool shall be able to add additional content to any graphic by importing images in the SVG, PNG or JPG file formats.
- 9. Historical trending and data collection
  - a. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:
    - 1) Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:
      - (a) Defined time interval
      - (b) Upon a change of value
      - (c) Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.
  - b. Trend and change of value data shall be stored within the engine and uploaded to a dedicated trend database or exported in a selectable data format via a provided data export utility. Uploads to a dedicated database shall occur based upon one of the following: user-defined interval, manual command, or when the trend buffers are full. Exports shall be as requested by the user or on a time scheduled basis.
- 10. Trend data viewing and analysis
  - a. Provide a trend viewing utility that shall have access to all database points.
  - b. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.
  - c. The trend viewing utility shall have the capability to define trend study displays to include multiple trends
  - d. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.
  - e. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.
  - f. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.
  - g. The Display shall support the user's ability to change colors, sample sizes, and types of markers.
- 11. Database Management

- a. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.
- b. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.
- c. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:
  - 1) Backup
  - 2) Purge
  - 3) Restore
- d. The Database Manager shall support four tabs:
  - 1) Statistics - shall display Database Server information and Trend, Alarm (Event), and Audit information on the databases.
  - 2) Maintenance - shall provide an easy method of purging records from the Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.
  - 3) Backup - Shall provide the means to create a database backup file and select a storage location.
  - 4) Restore - shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.
- e. The Status Bar shall appear at the bottom of all Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:
  - 1) Ready
  - 2) Purging Record from a database
  - 3) Action Failed
  - 4) Refreshing Statistics
  - 5) Restoring database
  - 6) Shrinking a database
  - 7) Backing up a database
  - 8) Resetting internet information Services
  - 9) Starting the Device Manager
  - 10) Shutting down the Device Manager
  - 11) Action successful
- f. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.
- g. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.
- h. The Monitoring Settings window shall have the following sections:
  - 1) General - Shall allow the user to set and review scan intervals and start times.
  - 2) Email - Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.
  - 3) Warning - shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.
  - 4) Alarm - shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.
  - 5) Database login - Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.
- i. The Monitoring Settings Taskbar shall provide the following informational icons:
  - 1) Normal - Indicates by color and size that all databases are within their limits.



- 2) Warning - Indicates by color and size that one or more databases have exceeded their Warning limit.
  - 3) Alarm - Indicates by color and size that one or more databases have exceeded their Alarm limit.
- j. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

#### 2.04 NETWORK AUTOMATION ENGINES (NAE)

- A. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Engines.
- B. Automation network - The NAE shall reside on the automation network and shall support a subnet of system controllers.
- C. User Interface - Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
- D. The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
- E. Network Automation Engines supporting 100 or fewer field controllers shall support a minimum of two (2) concurrent users. Network Engines with multiple field buses or supporting more than 100 field controllers shall support a minimum of four (4) concurrent users.
- F. The web based user shall have the capability to access all system data through one NAE.
- G. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.
- H. Systems that require the user to address more than one NAE to access all system information are not acceptable.
- I. The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.
- J. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
- K. The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:
  1. Configuration
  2. Commissioning
  3. Data Archiving
  4. Monitoring
  5. Commanding
  6. System Diagnostics
    - a. Systems that require workstation software or modified web browsers are not acceptable.
    - b. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.
    - c. Processor - The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control

- processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
- d. Memory - Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
  - e. Hardware Real Time Clock - The NAE shall include an integrated, hardware-Based, real-time clock.
  - f. Communications Ports - Network Automation Engines supporting 100 or fewer field controllers shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
    - 1) USB port
    - 2) URS-232 serial data communication port
    - 3) RS-485 port
    - 4) Ethernet port
7. Network Automation Engines with multiple field buses or supporting more than 100 field controllers shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
    - a. Two (2) USB port
    - b. Two (2) URS-232 serial data communication port
    - c. Two (2) RS-485 port
    - d. One (1) Ethernet port
  8. Diagnostics - The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
  9. Power Failure - In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
  10. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
  11. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
  12. Certification - The NAE shall be listed by Underwriters Laboratories (UL).

## 2.05 NETWORK CONTROL ENGINE (NCE)

- A. The Network Control Engine (NCE) shall meet all of the programming, supervisory and communications requirements of the Network Automation Engine described above plus provide the additional features and capabilities described below.
- B. The Network Control Engine (NCE) shall be a fully user-programmable, digital controller that includes a minimum of 33 I/O points. It shall reside on the automation network and shall support a subnet of 32 Field Controllers
- C. User Interface - Each NCE shall have the ability to deliver a web based User Interface (UI) as previously described for Network Automation Engines.
- D. The NCE shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals as well as four (4) hours per controller per warranty year per controller to re-tune

loops according to current system conditions. This time shall be equally divided between the change from heating season to cooling season and back to heating season.

- E. The NCE shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
- F. The NCE shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
- G. The NCE shall support the following number and types of inputs and outputs:
  - 1. Ten Universal Inputs - shall be configured to monitor any of the following:
    - a. Analog Input, Voltage Mode
    - b. Analog Input, Current Mode
    - c. Analog Input, Resistive Mode
    - d. Binary Input, Dry Contact Maintained Mode
    - e. Binary Input, Pulse Counter Mode
    - f. Eight Binary Inputs - shall be configured to monitor either of the following:
      - g. Dry Contact Maintained Mode
      - h. Pulse Counter Mode
  - 2. Four Analog Outputs - shall be configured to output either of the following
    - a. Analog Output, Voltage Mode
    - b. Analog Output, Current Mode
  - 3. Seven Binary Outputs - shall output the following:
    - a. 24 VAC Triac
  - 4. Four Configurable Outputs - shall be configured to output either of the following:
    - a. Analog Output, Voltage Mode
    - b. Binary Output, 24 VAC Triac Mode
  - 5. The NCE shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
  - 6. The NCE shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the Field Trunk or the SA Bus.
  - 7. All Network Control Engines shall be provided with a panel mountable Local Controller Display either as an integral part of the NCE or as a remote device communicating over the SA Bus.
  - 8. The Display shall use a BACnet Standard SSPC-135, clause 9 Master-Slave/Token-Passing protocol and shall allow the user to view monitored points without logging into the system.
  - 9. The Display shall provide password protection with User adjustable password time-out. It shall also allow the user to view and change setpoints, modes of operation, and parameters.
  - 10. The Display shall be menu driven with separate paths for:
    - a. Input/Output
    - b. Parameter/Setpoint
    - c. Overrides
  - 11. The Display shall use easy-to-read English text messages and shall allow the user to select the points to be shown and in what order.
  - 12. The Display shall support a back lit Liquid Crystal Display (LCD) with adjustable contrast and brightens and automatic backlight brightening during user interaction.
  - 13. The display shall be a minimum of 4 lines and a minimum of 20 characters per line

14. The NCE shall be microprocessor-based with a minimum word size of 32 bits. The processor shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NCE size and capability shall be sufficient to fully meet the requirements of this Specification.
15. Each NCE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
16. The NCE shall employ nonvolatile Flash memory to store all programs and data. The NCE shall employ a data protection battery to save data and power the real time clock when primary power is interrupted.
17. Communications Ports - The NCE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
  - a. USB port
  - b. RS-232 serial data communication port
  - c. RS-485 port
  - d. RJ-45 Ethernet port
  - e. RJ-12 jack
  - f. The NCE shall support an optional internal modem with RJ-12 6-pin telephone line connector.
18. Diagnostics - The NCE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Control Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
19. Power Failure - In the event of the loss of normal power, The NCE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
20. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
21. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
22. Field Controller Bus - The NCE shall support the same communication protocols as described for the Network Engines.

## 2.06 DDC SYSTEM CONTROLLERS

### A. Field Equipment Controller (FEC)

1. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that supports and communicates via BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network. It shall be BACnet Testing Labs (BTL) certified as a BACnet Application Specific Controller (B-ASC) and carry the BTL Label.
2. The FEC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals as well as four (4) hours per warranty year per controller to re-tune loops according to current system conditions. This time shall be equally divided between the change from heating season to cooling season and back to heating season.
3. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
4. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB. It shall include troubleshooting LED indicators.

5. The FEC shall support the following types of direct wired inputs and outputs:
  - a. Universal Inputs - shall be configured to monitor any of the following:
    - 1) Analog Input, Voltage Mode
    - 2) Analog Input, Current Mode
    - 3) Analog Input, Resistive Mode
    - 4) Binary Input, Dry Contact Maintained Mode
    - 5) Binary Input, Pulse Counter Mode
  - b. Binary Inputs - shall be configured to monitor either of the following:
    - 1) Dry Contact Maintained Mode
    - 2) Pulse Counter Mode
  - c. Analog Outputs - shall be configured to output either of the following:
    - 1) Analog Output, Voltage Mode
    - 2) Analog Output, current Mode
  - d. Binary Outputs - shall output the following:
    - 1) 24 VAC Triac
  - e. Configurable Outputs - shall be capable of the following:
    - 1) Analog Output, Voltage Mode
    - 2) Binary Output Mode
6. The FEC shall have the ability to reside on a Field Controller Bus (FC Bus).
7. The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
8. The FC Bus shall support communications between the FECs and NAE(s) or NCE(s).
9. The FC Bus shall also support Input/Output Module (IOM) communications with the FEC and with the NAE or NCE.
10. The FEC shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard Protocol SSPC-135, Clause 9.
11. The FEC shall support, but not be limited to, the following applications:
  - a. Optional chilled water/central plant optimization applications
  - b. Heating central plant applications
  - c. Built-up air handling units for special applications
  - d. Terminal & package units
  - e. Special programs as required for systems control
12. The FEC shall support the same Local Controller Display previously described for use with the Network Control Engine. All FEC controllers located indoors serving mechanical equipment other than ceiling hung terminal units shall be provided with their own Local Controller Display.

## 2.07 FIELD DEVICES

- A. Input/Output Module (IOM)
  1. The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.
  2. The IOM shall communicate with the FEC over the FC Bus or the SA Bus.
  3. The IOM shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
    - a. The IOM shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
    - b. The IOM shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
    - c. A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.
  4. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

B. Networked Thermostat (TEC)

1. The networked thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, reheat coil valves or other similar equipment.
2. The TEC shall communicate over the Field Controller Bus using BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.
3. The TEC shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
  - a. The TEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
  - b. A BACnet Protocol Implementation Conformance Statement shall be provided for the TEC.
4. The Networked Thermostat shall support remote read/write and parameter adjustment from the web based User Interfaceable through a Network Automation Engine.
5. The Networked Thermostat shall include an intuitive User Interface providing plain text messages.
  - a. Two line, 8 character backlit display
  - b. LED indicators for Fan, Heat, and Cool status
  - c. Five (5) User Interface Keys
    - 1) Mode
    - 2) Fan
    - 3) Override
    - 4) Degrees C/F
    - 5) Up/Down
  - d. The display shall continuously scroll through the following parameters:
    - 1) Room Temperature
    - 2) System Mode
    - 3) Schedule Status - Occupied/Unoccupied/Override
    - 4) Applicable Alarms
6. The Networked Thermostat shall provide the flexibility to support any one of the following inputs:
  - a. Integral Indoor Air Temperature Sensor
  - b. Duct Mount Air Temperature Sensor
  - c. Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator
  - d. Two configurable binary inputs
7. The Networked Thermostat shall provide the flexibility to support any one of the following outputs:
  - a. Three Speed Fan Control
  - b. Two On/Off
  - c. Two Floating
  - d. Two Proportional (0 to 10V)
8. The Networked Thermostat shall provide a minimum of six (6) levels of keypad lockout.
9. The Networked Thermostat shall provide the flexibility to adjust the following parameters:
10. Adjustable Temporary Occupancy from 0 to 24 hours
11. Adjustable heating/cooling deadband from 2° F to 5° F
12. Adjustable heating/cooling cycles per hour from 4 to 8
13. Where required by application and indicated on plans or room schedules provide the Networked Thermostat with an integral Passive Infra-Red (PIR) occupancy sensor.
14. The Networked Thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

2.08 SYSTEM TOOLS

A. System Configuration Tool (SCT)

1. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE).
2. The configuration tool shall provide an archive database for the configuration and application data.
3. The configuration tool shall have the same look-and-feel at the User Interface (UI) regardless of whether the configuration is being done online or offline.
4. The configuration tool shall include the following features:
  - a. Basic system navigation tree for connected networks
  - b. Integration of MultiSITE, Metasys N1, Tracer, LonWorks, and BACnet enabled devices
  - c. Customized user navigation trees
  - d. Point naming operating parameter setting
  - e. Graphic diagram configuration
  - f. Alarm and event message routing
  - g. Graphical logic connector tool for custom programming
  - h. Downloading, uploading, and archiving databases
5. The configuration tool shall have the capability to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:
  - a. BACnet Devices
  - b. LonWorks devices
6. The configuration tool shall be capable of programming the Field Equipment Controllers.
  - a. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
  - b. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
  - c. The configuration tool shall contain a library of standard applications to be used for configuration.
7. The configuration tool shall be capable of programming the field devices.
  - a. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
  - b. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
  - c. The configuration tool shall contain a library of standard applications to be used for configuration
8. A wireless access point shall allow a wireless enabled portable PC to make a temporary Ethernet connection to the automation network.
  - a. The wireless connection shall allow the PC to access configuration tool through the web browser using the User Interface (UI).
  - b. The wireless use of configuration tool shall be the same as a wired connection in every respect.
  - c. The wireless connection shall use the Bluetooth Wireless Technology.

## 2.09 INPUT DEVICES

### A. General Requirements

1. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.

### B. Temperature Sensors

1. General Requirements:
  - a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.

- b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.
- c. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

| Point Type       | Accuracy  |
|------------------|-----------|
| Accuracy         | +/- .5°F  |
| Room Temp        | +/- .5°F  |
| Duct Temperature | +/- .5°F  |
| All Others       | +/- .75°F |

- 2. Room Temperature Sensors
  - a. Room sensors shall be constructed for either surface or wall box mounting.
  - b. Room sensors shall have the following options:
    - 1) Setpoint reset slide switch providing a +3 degree (adjustable) range.
    - 2) A momentary override request push button for activation of after-hours operation.
- 3. Room Temperature Sensors with Integral Display
  - a. Room sensors shall have an integral display when specified in the sequence of operations or elsewhere in these documents.
- 4. Thermo wells
  - a. When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting.
  - b. Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
  - c. Thermo wells and sensors shall be mounted in a threadolet or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.
  - d. Thermo wells shall be constructed of 316 stainless steel.
- 5. Outside Air Sensors
  - a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
  - b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
  - c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.
- 6. Duct Mount Sensors
  - a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
  - b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
  - c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.
- 7. Averaging Sensors
  - a. For ductwork greater in any dimension than 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
  - b. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
  - c. Capillary supports at the sides of the duct shall be provided to support the sensing string.
- 8. Acceptable Manufacturers: Johnson Controls, Trane, LG, Setra.



C. Humidity Sensors

1. The sensor shall be a solid-state type, relative humidity sensor of the Bulk Polymer Design. The sensor element shall resist service contamination.
2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
3. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH @ 77 Deg F unless specified elsewhere.
4. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R enclosure with sealtite fittings and stainless steel bushings.
5. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
6. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.
7. Acceptable Manufacturers: Johnson Controls, Bapi, Trane, LG, Veris Industries, and Mamac.

D. Differential Pressure Transmitters

1. General Air and Water Pressure Transmitter Requirements:
  - a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
  - b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
  - c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
  - d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.
2. Building Differential Air Pressure Applications (-1" to +1" w.c.)
  - a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
  - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
    - 1) -1.00 to +1.00 w.c. input differential pressure ranges. (Select range appropriate for system application)
    - 2) 4-20 mA output.
    - 3) Maintain accuracy up to 20 to 1 ratio turndown.
    - 4) Reference Accuracy: +0.2% of full span.
  - c. Acceptable Manufacturers: Johnson Controls, Trane, LG, and Setra.
3. Low Differential Air Pressure Applications (0" to 5" w.c.)
  - a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
  - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
    - 1) (0.00 - 1.00" to 5.00") w.c. input differential pressure ranges. (Select range appropriate for system application.)
    - 2) 4-20 mA output.

- 3) Maintain accuracy up to 20 to 1 ratio turndown.
    - 4) Reference Accuracy: +0.2% of full span.
  - c. Acceptable Manufacturers: Johnson Controls, Dwyer, Trane, LG, and Setra.
- E. Status and Safety Switches
  - 1. General Requirements
    - a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.
  - 2. Current Sensing Switches
    - a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
    - b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
    - c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
    - d. Acceptable manufacturers: Veris Industries, Functional Devices, Johnson Controls, Trane, LG
  - 3. Air Filter Status Switches
    - a. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
    - b. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
    - c. Provide appropriate scale range and differential adjustment for intended service.
    - d. Acceptable manufacturers: Johnson Controls, Dwyer, Cleveland Controls, Trane, LG.
  - 4. Air Flow Switches
    - a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
    - b. Acceptable manufacturers: Johnson Controls, Cleveland Controls, Trane, LG
  - 5. Air Pressure Safety Switches
    - a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
    - b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
    - c. Acceptable manufacturers: Johnson Controls, Cleveland Controls, Trane, LG.
  - 6. Low Temperature Limit Switches
    - a. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
    - b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
    - c. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.
    - d. Acceptable manufacturers: Johnson Controls, Trane, LG.

## 2.10 OUTPUT DEVICES

### A. Actuators

1. General Requirements
  - a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.
2. Electronic Damper Actuators
  - a. Electronic damper actuators shall be direct shaft mount.
  - b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized Based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.
  - c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
  - d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
  - e. Acceptable manufacturers: Johnson Controls, Belimo, Honeywell, Mamac.
3. Electronic Valve Actuators
  - a. Electronic valve actuators shall be manufactured by the valve manufacturer.
  - b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
  - c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
  - d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
  - e. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.
  - f. Acceptable manufacturers: Johnson Controls, Belimo, Honeywell

**B. Control Valves**

1. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.
  2. Chilled water control valves shall be modulating plug, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application. In general, valves (2 or 3-way) serving variable flow air handling unit coils shall be sized for a pressure drop equal to the actual coil pressure drop, but no less than 5 PSI. Valves (3-way) serving constant flow air handling unit coils with secondary circuit pumps shall be sized for a pressure drop equal to 25% the actual coil pressure drop, but no less than 2 PSI. Mixing valves (3-way) serving secondary water circuits shall be sized for a pressure drop of no less than 5 PSI. Valves for terminal reheat coils shall be sized for a 2 PSIG pressure drop, but no more than a 5 PSI drop.
  3. Ball valves shall be used for hot and chilled water applications, water terminal reheat coils, radiant panels, unit heaters, package air conditioning units, and fan coil units except those described hereinafter.
  4. Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all special applications as indicated on the valve schedule. Valve discs shall be composition type. Valve stems shall be stainless steel.
  5. Butterfly valves shall be acceptable for modulating large flow applications greater than modulating plug valves, and for all two-position, open/close applications. In-line and/or three-way butterfly valves shall be heavy-duty pattern with a body rating comparable to the pipe rating, replaceable lining suitable for temperature of system, and a stainless steel vane. Valves for modulating service shall be sized and travel limited to 50 degrees of full open. Valves for isolation service shall be the same as the pipe. Valves in the closed position shall be bubble-tight.
  6. Acceptable manufacturers: Johnson Controls, Belimo, Armstrong.
- C. Electronic Signal Isolation Transducers
1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
  2. The signal isolation transducer shall provide ground plane isolation between systems.
  3. Signals shall provide optical isolation between systems.
  4. Acceptable manufacturers: Advanced Control Technologies, Kele, Johnson Controls, Trane, LG.

## 2.11 MISCELLANEOUS DEVICES

- A. Local Control Panels
1. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.
  2. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices-such as relays, transducers, and so forth-that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
  3. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.

4. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
5. All wiring shall be neatly installed in plastic trays or tie-wrapped.
6. A 120 volt convenience outlet, fused on/off power switch, and required transformers shall be provided in each enclosure.

### PART 3 - PERFORMANCE/EXECUTION

#### 3.01 BMS SPECIFIC REQUIREMENTS

- A. Graphic Displays
  1. Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
  2. User shall access the various system schematics via a graphical penetration scheme and/or menu selection. .
- B. Remote Access:
  1. (Optional) Via Client Portal software provide the Owner the ability to use a smart device such as a tablet PC, I-phone or other smart hone, to remotely monitor and control the BMS system. Provide unique login passwords to limit the remote user to the AC unit associated with his/her space within the building.

#### 3.02 INSTALLATION PRACTICES

- A. BMS Wiring
  1. All conduit, wiring, accessories and wiring connections required for the installation of the Building Management System, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
  2. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
  3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
  4. Class 2 Wiring
    - a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
    - b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
  5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
  6. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.
- B. BMS Line Voltage Power Source
  1. 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 16.

2. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.
  3. DDC terminal unit controllers may use AC power from motor power circuits.
- C. BMS Raceway
1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 3/4".
  2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
  3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
  4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.
- D. Penetrations
1. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
  2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
  3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
  4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
- E. BMS Identification Standards
1. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
    - a. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.
- F. BMS Panel Installation
1. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
  2. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.
- G. Input Devices
1. All Input devices shall be installed per the manufacturer recommendation
  2. Locate components of the BMS in accessible local control panels wherever possible.
- H. HVAC Input Devices - General
1. All Input devices shall be installed per the manufacturer recommendation
  2. Locate components of the BMS in accessible local control panels wherever possible.
  3. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
  4. Outside Air Sensors
    - a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
    - b. Sensors shall be installed with a rain proof, perforated cover.
  5. Building Differential Air Pressure Applications (-1" to +1" w.c.):
    - a. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
    - b. The interior tip shall be inconspicuous and located as shown on the drawings.

6. Duct Temperature Sensors:
  - a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
  - b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
  - c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
  - d. The sensor shall be mounted to suitable supports using factory approved element holders.
7. Space Sensors:
  - a. Shall be mounted per ADA requirements.
  - b. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
8. Low Temperature Limit Switches:
  - a. Install on the discharge side of the first water or steam coil in the air stream.
  - b. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.
  - c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.
9. Air Differential Pressure Status Switches:
  - a. Install with static pressure tips, tubing, fittings, and air filter.
10. Water Differential Pressure Status Switches:
  - a. Install with shut off valves for isolation.
- I. HVAC Output Devices
  1. All output devices shall be installed per the manufacturers recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.
  2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke.
  3. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.
  4. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

### 3.03 TRAINING

- A. The BMS contractor shall provide the following training services:
  1. Forty (40) hours of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

### 3.04 COMMISSIONING

- A. Fully commission all aspects of the Building Management System work.
- B. Acceptance Check Sheet
  1. Prepare a check sheet that includes all points for all functions of the BMS as indicated on the point list included in this specification.
  2. Submit the check sheet to the Engineer for approval

3. The Engineer will use the check sheet as the basis for acceptance with the BMS Contractor.
- C. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

**END OF SECTION 230923**



## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. The work specified as part of this Section consists of the integration of equipment controls supplied as part of manufactured items, materials and equipment required by the Drawings and under Divisions 23 and 26 to achieve operational and coordinated Sequences of Operation as Specified. Work shall include management of the system start up and operational check out, coordination of functions of controllers supplied as part of equipment packages, sizing of control valves and damper operators for dampers, interconnection of systems, provision and installation of all accessory devices required for complete system operation including dampers, control valves and actuators not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

## 1.02 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 00 and Division 01.
- B. The following Sections constitute related work:
  - 1. Section 230010 - General Mechanical Requirements
  - 2. Equipment and Systems specified under Division 23
  - 3. Division 26

## 1.03 QUALITY ASSURANCE

- A. System Installer Qualifications
  - 1. The Integrator shall have a minimum of five years experience in the integration of systems of a similar nature to those of this Project.
  - 2. The Integrator shall have an office within 50 miles of the project site and provide 24-hour response in the event of a customer call.
- B. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
  - 1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
  - 2. National Electrical Code - NFPA 70.
- C. All products used in this installation shall be new, currently under manufacture, and shall have been applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 5 years after completion of this Contract.

## 1.04 SUBMITTALS

- A. Submit at the time of bid the name and qualifications of the firm that will be responsible for the Integration function along with the qualifications of the specific personnel proposed. The Owner and Architect/Engineer may choose to interview the personnel proposed for the project.
- B. Contractor shall provide shop drawings and manufacturer's standard specification data sheets on all materials and hardware to be provided. No work may begin on any segment of this project until the Architect/Engineer and Owner have reviewed submittals for conformity with the

Drawings and Specifications. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats.

- C. Submit a written sequence of operation for each system indicating which functions are to be controlled by controls provided as part of manufactured equipment and which functions will be under control of devices provided as part of this Section.
- D. Submit interconnecting wiring diagrams for all systems. These diagrams may rely on diagrams for controls of manufactured equipment provided that the interface points are clearly identified and copies of the manufactured item's control diagrams are submitted for information as part of the submittal package.
- E. Submit any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.
- F. Submit the following within 30 days of contract award:
  - 1. A work plan and schedule for the start up and check out of all systems including time requirements and resources required from all Sub-Contractors involved.
  - 2. A complete list of equipment to be used indicating quantity, manufacturer and model number.
  - 3. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
  - 4. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
  - 5. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover.
  - 6. The submittals required under this Section shall be considered as For Information Only. Review by the Architect/Engineer shall not relieve the Contractor from the responsibility of providing fully operational systems.

#### 1.05 WARRANTY

- A. Warrant all work as follows:
  - 1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
  - 2. At the end of the final start-up/testing, if equipment and systems are operating in a manner satisfactory to the Owner and Architect/Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Specification. The date of Owner's acceptance shall be the start of warranty.

### PART 2 - PRODUCTS

#### 2.01 STANDARD OF QUALITY AND PERFORMANCE

- A. Products specified are not intended to form a complete scope of supply. They are intended to set a level of quality for items that the Contractor may need to supply to implement a complete Sequence of Operation. Products of a comparable quality and performance may be submitted for approval by the Architect/Engineer.

## 2.02 MOTORIZED DAMPERS

- A. Dampers shall be modulating double-acting opposed blade or parallel blade dampers as required, designed and tested in accordance with AMCA 500. Obtain and verify the location, size and pressure rating of each damper prior to fabrication and delivery. Verify the layout of equipment and ductwork before dampers are fabricated. Pressure drop shall not exceed 0.03 inches water gauge static pressure at 1000 fpm in the fully-open position, and shall be rated for at least 2000 fpm average velocity. Damper shut-off pressure rating shall exceed the fan maximum total head-pressure.
- B. Dampers shall be constructed of extruded aluminum or at least No. 16 gauge galvanized steel, with each blade being not more than 8 inches; wide damper frame channel shall be at least 5 inches deep. Each blade end shall have a 3/8 inch stainless steel or plated steel shaft rotating in self-lubricating bearings mounted in a damper channel frame. Blades mounted vertically shall be supported by thrust bearings. Control shaft shall be at least 1/2 inch diameter.
- C. Flat-steel damper blades shall be made rigid by folding the edges. Blades shall have interlocking edges and shall be provided with EPDM or neoprene compressible seals at point of contact. Foam seals are not acceptable. Provide compression-type stainless steel jamb seals continuously along blade edges.
- D. Each damper shall be assembled in the manufacturer's shop as a complete unit. Dampers, when closed, shall be guaranteed by the manufacturer not to leak in excess of 20 cfm per square foot at 4 inches w.g. static pressure. Provide dampers with operators having sufficient power to limit leakage to the rate specified.
- E. Damper seals shall be suitable for an operating range of minus 20 degrees F (or 20 degrees F below the heating outside design temperature, whichever is lower) at the lower end to 200 degrees F at the upper end.
- F. A complete damper assembly shall have blades no longer than 48 inches and no higher than 48 inches. Where greater length or height is required, the assembly shall be made of a combination of sections. Dampers shall be sized for the required air velocity and pressure classification.
- G. Approved Manufacturers:
  - 1. Arrow Damper & Louver or approved equal.
  - 2. Greenheck
  - 3. Ruskin

## 2.03 ELECTRONIC DAMPER/VALVE ACTUATORS

- A. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
- B. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
  - 1. Damper actuators shall fail normally open or closed as described on the Drawings or as follows:
    - a. Outdoor Air Intake - normally closed.
    - b. Air Exhaust - normally closed.
    - c. Other applications - as required by the Sequence of Operation.
- C. All rotary spring return actuators shall be capable of both clockwise and counter clockwise spring return operation.

- D. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
- E. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not required more than 11 VA.
- F. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
- G. Actuators shall be provided with a conduit fitting and a minimum 1 meter electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
- H. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation
- I. Actuators shall be Underwriters Laboratories Standard 873 listed.
- J. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.
- K. Provide a single damper actuator when dampers are less than 4 feet in width. Otherwise provide two damper actuators (one on each side of the ductwork).
- L. Approved Manufacturers
  - 1. Belimo
  - 2. Honeywell
  - 3. Johnson Controls

#### 2.04 CONTROL VALVES

- A. Control valves shall be two-way or three-way type for two-position or modulating service as required.
- B. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
  - 1. Water Valves:
    - a. Two-way: 150% of total system (pump) head.
    - b. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
  - 2. Steam Valves: 150% of operating (inlet) pressure.
- C. Valve Failure Position:
  - 1. Valves shall fail normally open or closed as indicated on the Drawings or as follows:
    - a. Heating coils in air handlers - normally open.
    - b. Chilled water control valves - normally closed
    - c. Other applications - as scheduled or as required by Sequence of Operation.
  - 2. Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.
- D. Water Valves:
  - 1. Body and trim materials shall be as specified in "Pipe, Valve & Fittings" specification. Equal percentage ports for modulating service.

2. Sizing Criteria:
  - a. Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), [5] psi maximum.
  - b. Contractor shall verify sizing criteria with manufacturer.
- E. Approved Manufacturers:
  1. Griswold Controls
  2. Johnson Controls
  3. Armstrong
  4. Bray

## 2.05 TEMPERATURE SENSORS

- A. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.
- B. Duct sensors shall be rigid or averaging as required. Averaging sensors shall be a minimum of 5 feet in length.
- C. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
- D. Space sensors shall be equipped with set-point adjustment, override switch, display, and communication port.
- E. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.2 degrees F.
- F. The space temperature, setpoint, and override confirmation shall be annunciated by a digital display for each zone sensor. The setpoint shall be selectable utilizing buttons.

## 2.06 HUMIDITY SENSORS

- A. Room Humidity sensors shall have an accuracy of  $\pm 1\%$  25°C from 10% to 80% RH with One-point adjustment calibration. The operating temperature range shall be -10° to 150°F max.
- B. Duct sensors shall have a sensing range of 20% to 80% with accuracy of  $\pm 1\%$  R.H. Duct sensors shall be provided with a sampling chamber.
- C. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. and shall be suitable for ambient conditions of -40 degrees F to 170 degrees F.
- D. Humidity sensor's drift shall not exceed 1% of full scale per year.

## 2.07 STATIC PRESSURE SENSORS

- A. Sensor shall have linear output signal. Zero and span shall be field-adjustable.
- B. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
- C. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.
- D. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be

3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

#### 2.08 LOW LIMIT THERMOSTATS

- A. Safety low limit thermostats shall be vapor pressure type with an element 20 ft minimum length. Element shall respond to the lowest temperature sensed by any one foot section.

#### 2.09 FLOW SWITCHES

- A. Flow-proving switches shall be either paddle or differential pressure type, as shown on the Drawings or as specified.
- B. Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified:
- C. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.
- D. Current sensing relays may be used for flow sensing or terminal devices.

#### 2.10 RELAYS

- A. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
- B. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

#### 2.11 TRANSFORMERS AND POWER SUPPLIES

- A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
- B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
- C. Unit shall operate between 0 degrees C and 50 degrees C.
- D. Unit shall be UL recognized.

#### 2.12 CURRENT SWITCHES

- A. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the control system.

### 2.13 LOCAL CONTROL PANELS

- A. All indoor control cabinets shall be fully enclosed NEMA 1 or NEMA 4 rating as required. Provide cabinet with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.
- B. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
- C. Provide on/off power switch with over-current protection and main air gauge for control power sources to each local panel.

### 2.14 AIR FLOW MEASURING STATIONS

- A. Air flow measuring stations shall be multi-point, multi-axis flow ring or cross sensor. Single point or flow bar sensors are not acceptable. The airflow measurement station shall measure from 15 percent to 100 percent of unit nominal airflow. The air flow measuring station shall adjust for temperature variations and shall provide a 2 to 10 Vdc signal that corresponds to actual airflow for controlling and documenting airflow. The accuracy of the airflow measurement station shall be +/- 5 percent.
- B. Air flow measuring stations shall be provided by the air handler manufacturer or the VAV box manufacturer. See air handler or VAV box specification section for more details.

## PART 3 - EXECUTION

### 3.01 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible location as defined by Chapter 1 Article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

### 3.02 WIRING

- A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these Specifications. Where the requirements of this Section differ with those in Division 26, the requirements of this Section shall take precedence.
- B. Do not install Class 2 wiring in conduit containing Class 1 wiring. Do not use boxes and panels containing high voltage for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

- C. Control wiring located in a plenum space that is not installed in a conduit shall be plenum rated.
- D. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal blocks, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- E. Maximum allowable voltage for control wiring shall be 120V. Provide and install step down transformers.
- F. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
- G. Maintain fire rating at all penetrations in accordance with other Sections of this Specification and local codes.
- H. Size of conduit and size and type of wire shall be the design responsibility of the Contractor, in keeping with the manufacturer's recommendations and the NEC.
- I. Locate control and status relays in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.
- J. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.
- K. Adhere to Division 26 requirements for installation of raceway.
- L. Maintain an updated (as-built) wiring diagram with terminations identified at the job site.
- M. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3feet in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture liquid tight, flexible metal conduits shall be used.

### 3.03 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Install duct static pressure tap with tube end facing directly down-stream of air flow.
- F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.



- H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

### 3.04 FLOW SWITCH INSTALLATION

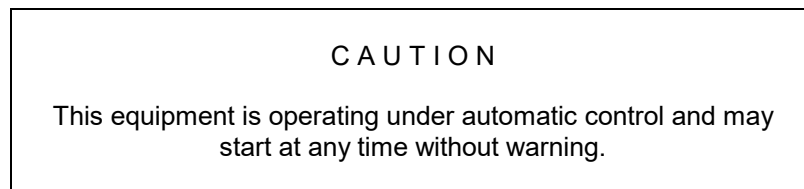
- A. Install using a thread-o-let in steel pipe. In copper pipe use C x C x F Tee, no pipe extensions or substitutions allowed.
- B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream or 2 feet whichever is greater, from fittings and other obstructions.
- C. Install in accordance with manufacturers' instructions.
- D. Assure correct flow direction and alignment.
- E. Mount in horizontal piping - flow switch on top of the pipe.

### 3.05 ACTUATOR INSTALLATION

- A. Mount and link control damper actuators per manufacturer's instructions.
- B. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5 degrees open position, manually close the damper, and then tighten the linkage.
- C. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
- D. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

### 3.06 WARNING LABELS

- A. Affix plastic labels on each starter and equipment automatically controlled. Label shall indicate the following:



### 3.07 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2 inches of termination with a cable identifier and other descriptive information.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.

- C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.
- D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

### 3.08 CLEANING

- A. The Contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.
- B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

### 3.09 PROTECTION

- A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

### 3.10 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

### 3.11 ACCEPTANCE

- A. The control systems will not be accepted as meeting the requirements of completion until all tests described in this Specification have been performed to the satisfaction of both the Engineer and Owner.
- B. The full range of operation for all Sequences of Operation shall be demonstrated. Where sequences are dependent on season or outside conditions these conditions may be simulated for the purpose of demonstration if approved by both the Architect/Engineer and the Owner. If simulations cannot be acceptably created the Contractor shall perform the demonstration during the proper period.

- C. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

**END OF SECTION 230991**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. The Work specified as part of this Section consists of the work required to achieve operational and coordinated Sequences of Operation as described. Work includes coordination of functions of controllers supplied as part of equipment packages, sizing of control valves, interconnection of systems, provision and installation of all accessory devices required for complete system operation including devices not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his/her representatives.
- B. The control system operation of all equipment shall be subject to the operational modes, conditions and logic described in this Section and the controlled equipment manufacturer's recommendations.
- C. Training of the Owner's personnel in the operation, trouble shooting, adjustment and repair of all system controls.

## 1.02 RELATED SECTIONS AND WORK

- A. Section 230923 – Automatic Temperature Controls and Building Automation System
- B. Division 26
- C. Owner's Building Management System (BMS)
- D. Owner's Fire Alarm System (FAS)

## PART 2 - PRODUCTS

NOT USED.

## PART 3 - EXECUTION

## 3.01 GENERAL

- A. General
  - 1. Conform to the requirements of the Owner's standards for all electrical work and devices.
  - 2. System and system components shall be BACNet compatible.
  - 3. All set points and operating points shall be able to be transmitted to and set from the BMS system. Specific points to be enabled shall be at the discretion of the Owner.
  - 4. All systems shall be capable of operating independently of the BMS system based on set points and limits either input from the BMS system or manually.
  - 5. Coordinate all work with the requirements and characteristics of the BMS system and the equipment provided for the project under this phase or earlier phases.
  - 6. All space sensors and thermostats shall have an lcd display indicating their set point, the condition sensed and the mode of operation they are responding to.

## 3.02 GAS DETECTION SYSTEMS [GDS-1, GDS-2, GDS-SB-1]

- A. Refer to Specifications 236002 and 236002.22

## 3.03 ROOFTOP UNIT [RTU-208]

- A. Run Conditions - Scheduled:

- B. The unit shall run according to a user definable time schedule in the following modes:
  - 1. Occupied Mode:
    - a. 75°F (adj.) cooling setpoint
    - b. 70°F (adj.) heating setpoint
  - 2. Unoccupied Mode (night setback):
    - a. 85°F (adj.) cooling setpoint.
    - b. 55°F (adj.) heating setpoint.
- C. Alarms shall be provided as follows:
  - 1. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
  - 2. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- D. Freeze Protection:
  - 1. The unit shall shut down and generate an alarm upon receiving a freezestat status.
- E. Supply Fan:
  - 1. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
- F. Alarms shall be provided as follows:
  - 1. Supply Fan Failure: Commanded on, but the status is off.
- G. Cooling Stages:
- H. The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
  - 1. The cooling shall be enabled whenever:
    - 2. Outside air temperature is greater than 60°F (adj.).
    - 3. AND the economizer (if present) is disabled or fully open.
    - 4. AND the zone temperature is above cooling setpoint.
    - 5. AND the supply fan status is on.
    - 6. AND the heating is not active.
- I. Heating Coil Valve:
- J. The controller shall measure the zone temperature and modulate the heating coil valve to maintain its heating setpoint.
- K. The heating shall be enabled whenever:
  - 1. Outside air temperature is less than 65°F (adj.).
  - 2. AND the zone temperature is below heating setpoint.
  - 3. AND the supply fan status is on.
  - 4. AND the cooling is not active.
- L. The heating coil valve shall open whenever the freezestat (if present) is on.
- M. Economizer:
  - 1. The controller shall measure the zone temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F less than the zone cooling setpoint. The outside air dampers shall maintain a minimum adjustable position of 20% (adj.) open whenever occupied.

2. The economizer shall be enabled whenever:
    - a. Outside air temperature is less than 65°F (adj.).
    - b. AND the outside air temperature is less than the return air temperature.
    - c. AND the supply fan status is on.
  3. The economizer shall close whenever:
    - a. On loss of supply fan status.
    - b. OR the freezestat (if present) is on.
  4. The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If Optimal Start Up is available, the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.
- N. Minimum Outside Air Ventilation - Fixed Percentage:
1. The outside air dampers shall maintain a minimum position (adj.) during building occupied hours and be closed during unoccupied hours.
- O. Dehumidification:
1. The controller shall measure the return air humidity and override the cooling sequence to maintain return air humidity at or below 60% rh (adj.).
  2. During dehumidification, the heating shall modulate to maintain a setpoint 1°F (adj.) less than the zone cooling setpoint.
  3. Dehumidification shall be enabled whenever:
    - a. The supply fan status is on.
    - b. AND zone temperature is greater than the cooling setpoint.
- P. Space Humidity:
1. The controller shall monitor the space humidity and use as required for economizer control or humidity control.
- Q. Alarms shall be provided as follows:
1. High Space Humidity: If the return air humidity is greater than 70% (adj.).
  2. Low Space Humidity: If the return air humidity is less than 35% (adj.).
- R. Return Air Temperature:
1. The controller shall monitor the return air temperature and use as required for economizer control
  2. Alarms shall be provided as follows:
    - a. High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
    - b. Low Return Air Temp: If the return air temperature is less than 45°F (adj.).
- S. Supply Air Temperature:
1. The controller shall monitor the supply air temperature.
  2. Alarms shall be provided as follows:
    - a. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
    - b. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

### 3.04 DEDICATED OUTDOOR AIR UNIT [DOAS-1]

- A. Factory Controller: Controller shall be provided with required sensors and programming for rooftop unit. Controller shall be factory programmed, mounted and tested. Controller shall have an LCD readout for changing set points and monitoring unit operation.
- B. UNIT START COMMAND
1. Factory mounted and wired outdoor air and recirculated air damper actuators are powered.
  2. Exhaust fan starts after a (adj.) delay.

3. Supply fan starts after a (adj.) delay.
  4. Tempering options and energy wheel options to function as described below.
- C. UNIT STOP COMMAND (OR DE-ENERGIZED):
1. Supply fan, exhaust fan, energy wheel and tempering options de-energized.
  2. Outdoor air damper actuator is spring return close, and the recirculated air damper actuator is spring open.
- D. OCCUPIED/UNOCCUPIED MODES: Shall be based on a 7-day time clock internal to the controller. The schedule shall be set by the end user via the BMS
1. Occupied Mode:
    - a. Damper control per below
    - b. Energy wheel control per below.
    - c. Exhaust fan ON.
    - d. Supply fan ON.
    - e. Heating per below.
    - f. Cooling per below.
  2. Unoccupied mode (Cycle on Room Temp): The unit will cycle to maintain unoccupied room set points if there is a call for unoccupied heating, cooling or dehumidification.
    - a. Supply fan OFF
    - b. Exhaust fan OFF
    - c. Recirculation air damper open.
    - d. Outdoor air damper closed.
    - e. On a call for heating (room temp set point – differential) supply fan cycles ON, and the heating increases the room temperature. Unit cycles off when room temperature reaches the unoccupied set point (adj.).
    - f. On a call for cooling (room temp set point + differential) supply fan cycles ON, and the cooling decreases the room temperature. Unit cycles off when room temperature reaches the unoccupied set point (adj.)
- E. MORNING WARMUP/COOL DOWN: Prior to occupancy, the unit will run using the warmup or cool down sequence until the occupied set point is achieved. The heating or cooling mode must not be locked out and the space temperature is below or above set point by the unoccupied hysteresis (adj.)
- F. SUPPLY BLOWER SEQUENCE: The supply blower is provided with a factory mounted variable frequency drive. The supply blower speed will be controlled with the following sequence.
- G. BMS Control: The supply blower is modulated based upon a command from the Building Management System.
- H. Outdoor Air Damper Control: The outdoor air damper is factory mounted and wired with a non-modulating actuator. When the unit is enabled/occupied the outdoor air damper will open to 100%
- I. EXHAUST BLOWER SEQUENCE: The exhaust blower is provided with a factory mounted variable frequency drive. The exhaust blower speed will be controlled with the following sequence.
- J. BMS Control: The exhaust blower is modulated based upon a command from the Building Management System.
- K. COOLING SEQUENCE: The cooling is controlled to maintain the supply temperature set point. The mechanical cooling will be locked out when the outside air is < 55 F (adj.).
1. Packaged DX Cooling (Digital Scroll): The controller will provide a modulating signal for cooling. From 10-50%, the digital scroll will be controlled to maintain discharge

- temperature. From 50-100% the second stage will be on in combination with the digital scroll compressor to maintain the discharge temperature.
2. Modulating Hot Gas Reheat Sequence: During dehumidification the modulating HGRH is controlled to maintain the supply temperature set point.
  3. Modulating Head Pressure Control: Lead condenser fan will have an EC motor and will modulate to maintain a head pressure set point.
- L. DEHUMIDIFICATION CONTROL SEQUENCE: The cooling is controlled to maintain the cooling-coil set point. The dehumidification sequence will be locked out when the OA is < 10 F(adj.) above the cold-coil set point (adj.)
1. Cold Coil Set Point Control: The controller will control the cooling to maintain a cold coil set point. The active set point will set to local control (55 F, adj.) from the factory and can be field adjusted locally or by the BMS.
- M. REHEAT SEQUENCE: While the unit is in dehumidification mode the outdoor air will be reheated via Modulating Hot Gas Reheat for space neutral applications.
1. Modulating Hot Gas Reheat: The controller will modulate the hot gas reheat valve with a 0-10 V signal to maintain the supply temperature set point (adj.).
- N. HEATING SEQUENCE: The heating is controlled to maintain the supply temperature set point. The heating will be locked out when the outside air is > 80 F (adj.). Maximum allowable discharge air set point is 100 F.
1. Hot Water Coil: The controller will modulate a hot water valve (field provided) to maintain the supply temperature set point (adj.). Coil Freeze protection must be provided by others in the field.
- O. TEMPERATURE CONTROL SEQUENCE: The unit will maintain the supply air discharge setpoint per the following. Adjustable locally or by BMS.
1. Space Setpoint Control: The supply setpoint will adjust between minimum (adj.) and maximum (adj.) limits, to satisfy the desired space temperature setpoint. Adjustable locally or by BMS.
- P. BUILDING FREEZE PROTECTION: If the supply air temperature drops below 35 F (adj.) for 300s (adj.), the controller will de-energize the unit and activate the alarm output.
- Q. TEMPERATURE PROTECTION: The controller will enable the supply fan to modulate down to help the unit keep up with heating demand in the event of wheel failure or the unit operating outside design conditions. (This can be enabled under the manufacturer menu in the controller)
- R. ENERGY WHEEL FROST CONTROL: Frost control for the energy wheel is enabled when frost is present on the wheel; based on the outside air temperature and the pressure drop across the wheel. If the outdoor air temperature is below 5 F adj. and the differential pressure across the wheel is about 1.5", adj. frost control will enable.
1. Wheel VFD (Modulate Wheel): When frosting is occurring, the VFD modulates the wheel down to a slow rotational speed to defrost wheel. Once either the pressure drop decreases below the pressure switch setpoint, or the outdoor air temperature increases about the temperature set point, the unit will resume normal operation.
- S. ECONOMIZER SEQUENCE: When the application requires cooling, and the outdoor air conditions are suitable for free cooling, the controller will modulate the energy wheel speed to maintain the discharge temperature setpoint. If the energy wheel speed modulates to the economizer set point and the supply air temperature is not met, the controller will increase the call for cooling to meet the supply air temperature and could engage mechanical cooling.
1. Temp./Enthalpy: The economizer will be locked out when: the outdoor air is < 40 F DB (adj.) or > 75 F DB (adj.) or > 55 F dew point (adj.); the unit is operating in dehumidification mode; or there is a call for heating



**T. ENERGY WHEEL SEQUENCE**

1. Modulate Wheel: When economizer mode is enabled and there is a signal for cooling, the wheel VFD modulates wheel speed to maintain the supply air temperature set point.

**U. ALARMS INDICATION:** The controller will display alarms and have one digital output for remote indication of an alarm condition. Possible alarms include:

1. Building Management System: The controller will send all alarms to the BMS.
2. Dirty Filter Alarm: A digital signal is sent to the controller indicating an increased pressure drop across the outdoor, exhaust, or supply air filters (Must be adjusted in field during start up). The controller will then provide a dirty filter alarm.
3. Dirty Wheel Alarm: The controller monitors pressure across the wheel and sends an alarm in the case of an increased pressure drop.
4. Wheel Rotation Alarm: The controller monitors wheel rotation, if the wheel does not rotate for a set period-of-time (adj.) an alarm will generate.
5. Supply and Exhaust Air Alarm: The controller monitors the proving switch on each blower and sends an alarm in the case of either blower proving switch not engaging.
6. DX Alarm: The controller monitors the refrigerant pressure. In the case of low refrigerant pressure, the compressors will shut down until refrigerant pressure returns to normal values and the controller will send an alarm. In the case of high refrigerant pressure, the compressors will shut down, requiring a manual reset and the controller will send an alarm.
7. Temperature Sensor Alarm: The controller sends an alarm in the case of a failed air temperature sensor.
8. Humidity Sensor Alarm: The controller sends an alarm in the case of a failed humidity sensor.

**V. ACCESSORIES:** The following accessories will be included with the unit to expand the functionality or usability of the controller.

1. BMS Interfacing: A BMS port or serial card is provided with the controller for field interfacing with a building management system. Each card is sent out with the default parameters, and the controls contractor must change the appropriate addresses to match the BMS settings.
2. Make-Up Air Unit [MAU-1] See Kitchen Exhaust System Diagrams

**3.05 VRF SYSTEM [EU/IU/FCU-X] (TYPICAL OF 19) [CU-1,2,3]**

- A. Occupied and unoccupied modes of the unit's will be interlocked with the occupied/ unoccupied schedules of the respective zone schedules from the BMS. Units will be indexed to run and maintain room temperature setpoints under their own controls. During the unoccupied mode, the room temperature setpoint will be set back.

**3.06 BOILER SYSTEM: INTEGRATION TO BMS VIA BACNET MS/TP (GATEWAY BY MANUFACTURER)**

- A. The boiler system shall be enabled to run whenever:
  1. Outside air temperature is less than 65°F (adj.).
- B. The boiler shall run subject to its own internal safeties and controls.
- C. The boiler system shall also run for freeze protection whenever the outside air temperature is less than 38°F (adj.).
- D. Boiler Lead/Standby Operation:
  1. The two boilers shall operate in a lead/standby fashion staging will occur based on the boiler's internal controls.
  2. Alarms shall be provided as follows:

- a. Boiler 1,2 Failure: Commanded on but the status is off.
  - b. Lead Boiler Failure: The lead boiler is in failure and the standby boiler is on.
- E. Hot Water Supply Temperature Setpoint:
  - 1. The boiler shall maintain a hot water supply temperature setpoint as determined by its own internal controls.
- F. Primary Hot Water Temperature Monitoring:
  - 1. The following temperatures shall be monitored:
    - a. Primary hot water supply.
    - b. Primary hot water return.
  - 2. Alarms shall be provided as follows:
  - 3. High Primary Hot Water Supply Temp: If greater than 200°F (adj.).
  - 4. Low Primary Hot Water Supply Temp: If less than 100°F (adj.).

### 3.07 HEATING HOT WATER LOOP PUMPS [HWP-1,2,3,4,5,6]

- A. Hot Water Pump Run Conditions:
  - 1. The hot water pumps shall be enabled whenever:
    - a. Outside air temperature is less than 54°F (adj.)
  - 2. To prevent short cycling, the pump shall run for a minimum time and be off for a minimum time (both user adjustable).
- B. Hot Water Pump Lead/Lag Operation:
  - 1. The two variable speed hot water pumps shall operate in a lead/lag fashion.
    - a. The lead pump shall run first.
    - b. On failure of the lead pump, the lag pump shall run and the lead pump shall turn off.
- C. Pump Speed will be controlled based on the pumps self-sensing differential pressure transmitter.
- D. The designated lead pump shall rotate upon one of the following conditions (user selectable):
  - 1. manually through a software switch
  - 2. if pump runtime (adj.) is exceeded
  - 3. daily
  - 4. weekly
  - 5. monthly
- E. Alarms shall be provided as follows:
  - 1. Hot Water Pump Failure: Commanded on, but the status is off.
- F. Hot Water Temperature Monitoring:
  - 1. The following temperatures shall be monitored:
    - a. Hot water supply temperature (Building, Radiant, Unit Heaters).
    - b. Hot water return temperature (Building, Radiant, Unit Heaters).
  - 2. Alarms shall be provided as follows:
    - a. High Hot Water Supply Temp: If the hot water supply temperature is greater than 200°F (adj.).
    - b. Low Hot Water Supply Temp: If the hot water supply temperature is less than 100°F (adj.).

### 3.08 CABINET HEATER [CUH-A, B,126]

- A. Run Conditions - Scheduled:
  - 1. The unit shall run according to a user definable time schedule in the following modes:

- a. Occupied Mode: The unit shall maintain a heating setpoint of 70°F (adj.).
  - b. Unoccupied Mode (night setback): The unit shall maintain a heating setpoint of 65°F (adj.).
- B. Alarms shall be provided as follows:
  - 1. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- C. Fan:
  - 1. The fan shall run anytime the zone temperature is below heating setpoint, unless shutdown on safeties.
- D. Heating Coil Valve:
  - 1. The controller shall measure the zone temperature and open the heating coil valve to maintain its heating setpoint.
  - 2. The heating shall be enabled whenever:
    - a. Outside air temperature is less than 65°F (adj.).
    - b. AND the zone temperature is below heating setpoint.
    - c. AND the fan is on.
- E. Fan Status:
  - 1. The controller shall monitor the fan status.
  - 2. Alarms shall be provided as follows:
    - a. Fan Failure: Commanded on, but the status is off

### 3.09 UNIT HEATER [UH-1,2,3,4]

- A. Run Conditions - Scheduled:
  - 1. The unit shall run according to a user definable time schedule in the following modes:
    - a. Occupied Mode: The unit shall maintain a heating setpoint of 70°F (adj.).
    - b. Unoccupied Mode (night setback): The unit shall maintain a heating setpoint of 65°F (adj.).
- B. Alarms shall be provided as follows:
  - 1. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- C. Fan:
  - 1. The fan shall run anytime the zone temperature drops below heating setpoint, unless shutdown on safeties.
- D. Heating Coil Valve:
  - 1. The controller shall measure the zone temperature and modulate the heating coil valve to maintain its heating setpoint.
- E. The heating shall be enabled whenever:
  - 1. Outside air temperature is less than 65°F (adj.).
  - 2. AND the zone temperature is below heating setpoint.
  - 3. AND the fan is on
  - 4. Convective / Fin Tube Heater (typical of 1)

### 3.10 FIN TUBE HEATERS [FTR-X] (TYPICAL OF 22)

- A. Run Conditions - Continuous:
  - 1. The unit shall run continuously and shall maintain a heating setpoint of 70°F (adj.).

- B. Alarms shall be provided as follows:
  - 1. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- C. Heating Coil Valve:
  - 1. The controller shall measure the zone temperature and open the heating coil valve to maintain its heating setpoint.
- D. The heating shall be enabled whenever:
  - 1. Outside air temperature is less than 65°F (adj.).
  - 2. AND the zone temperature is below heating setpoint.

### 3.11 RADIANT HEATING ZONES [RFM-X] (TYPICAL OF 8)

- A. Run Conditions - Continuous:
  - 1. The unit shall run continuously and shall maintain a heating setpoint of 70°F (adj.).
- B. Alarms shall be provided as follows:
  - 1. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- C. Heating Coil Valve:
  - 1. The controller shall measure the zone temperature and open the heating coil valve to maintain its heating setpoint.
- D. The heating shall be enabled whenever:
  - 1. Outside air temperature is less than 65°F (adj.).
  - 2. AND the zone temperature is below heating setpoint.

### 3.12 EXHAUST FAN [TX-1]

- A. Run Conditions - Scheduled:
  - 1. The unit shall run according to a user definable time schedule:
- B. Fan:
  - 1. The fan shall have a user definable (adj.) minimum runtime.
- C. Exhaust Air Damper:
  - 1. The exhaust air damper shall open anytime the unit runs and shall close anytime the unit stops. The exhaust air damper shall close 30 sec (adj.) after the fan stops.
- D. Fan Status:
  - 1. The controller shall monitor the fan status.
- E. Alarms shall be provided as follows:
  - 1. Fan Failure: Commanded on, but the status is off

### 3.13 SEQUENCE OF OPERATION - CEILING PROPELLER FANS HVLS-SB-1, 2, 3

- A. General:
  - 1. Greenheck control system shall automatically adjust fans based on temperature.

## 3.14 SEQUENCE OF OPERATION - GAS FIRED RADIANT CEILING HEATERS, GFRH-SB-1,2,3

- A. If space temperature falls below 55F (user adjustable) the thermostat shall call for heating and the unit shall operate in order to maintain the set point temperature. Reznor control system shall control gas valve position and fan operation.
- B. Upon satisfaction of the set point temperature, the unit shall turn off.
- C. Heaters shall be interlocked with bay doors. If one or more doors are open, heaters shall turn off. When all doors are proven closed, heaters shall restart.

## 3.15 SEQUENCE OF OPERATION - ELECTRIC WALL HEATER, WMH-SB-1

- A. General:
  - 1. Each wall heater shall be provided with a unit mounted digital thermostat.
- B. Heating:
  - 1. The heating set point temperature shall be 70 degrees (adj.). When the space temperature falls below the set point temperature, the heater shall turn on in order to maintain the set point temperature.

## 3.16 SEQUENCE OF OPERATION - EXHAUST FANS, GXF-SB-2

- A. General:
  - 1. The exhaust fan shall run continuously 24 hours a day, 7 days a week.

## 3.17 SEQUENCE OF OPERATION - EXHAUST FANS, GXF-SB-1

- A. General:
  - 1. Provide a 30 minute spring timer, thermostat and gas detection system to serve fans.
- 2. Operation
  - a. Off: Fans with associated motorized dampers shall be off and Apparatus Bay intake motorized dampers sleeved in louver assembly shall be closed.
  - b. On: Apparatus Bay intake motorized dampers in louver assembly shall open, the fans shall operate and all associated motorized dampers shall be open.
  - c. Timer: Apparatus Bay intake motorized dampers sleeved in louver assembly (LV-SB-2,3,4) shall open and the fan shall operate.
  - d. Exhaust fan shall be enabled and associated motorized damper (MD-SB-1) when the space temperature rises above setpoint (85 degrees F (adj.)) or alarm from gas detection panel or manually via spring timer. Refer to Vehicle Exhaust Gas Detection System sequence for more information.

## 3.18 SEQUENCE OF OPERATION - EXHAUST FAN, TXF-SB-1

- A. General:
  - 1. The exhaust fan shall run according to a user definable time schedule.

## 3.19 SEQUENCE OF OPERATION - VARIABLE REFRIGERANT FLOW (VRF) UNITS AC-SB-1 &amp; ACCU-SB-1

- A. Cooling Operation:
  - 1. The unitary controller will call for cooling when measured room temperature is 1.8FDB above setpoint and adjust refrigerant flow and capacity based on differential from setpoint. The unit will remain in an active call for cooling until the measured room temperature is 1.8FDB below setpoint. Cooling setpoint shall be 74F, adjustable.

2. The indoor fan will operate based on user selected fan speed setting at the unitary controller and will allow for High, Medium, and Low selection. The fan speed will remain constant in the cooling mode regardless of the cooling cycle being called for.

B. Heating Operation

1. The unitary controller will call for heating when measured room temperature is 1.8FDB below setpoint and adjust refrigerant flow and capacity based on differential from setpoint. The unit will remain in an active call for heating until the measured room temperature is 1.8FDB above setpoint. Heating setpoint shall be 68F, adjustable.
2. The indoor fan will operate based on user selected fan speed setting at the unitary controller and will allow for High, Medium, and Low selection. The fan speed will remain constant during heating/and or cooling operation.

- C. Provide 7-day programmable thermostat.

**END OF SECTION 230993**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This Section describes the pipe, valves, fittings, and joining materials for use with the piping systems described in this Section and as shown on the Drawings.

## 1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 079201 - Non-Fire Rated Sleeves and Seals
- C. Section 230529 - Pipe Hangers and Supports
- D. Section 230555 - Mechanical System Identification
- E. Section 230700 - Pipe Insulation
- F. Section 232007 - Piping Specialties

## 1.03 ABBREVIATIONS

- A. The following are standard abbreviations:
  - 1. CWP: Cold working pressure.
  - 2. EPDM: Ethylene-propylene-diene-terpolymer rubber.
  - 3. NRS: Nonrising stem.
  - 4. OS&Y: Outside screw and yoke.
  - 5. PTFE: Polytetrafluoroethylene plastic.
  - 6. SWP: Steam working pressure.
  - 7. TFE: Tetrafluoroethylene plastic.
  - 8. NPS: Nominal Pipe Size

## 1.04 SUBMITTALS

- A. Product Data: For each type of valve indicated: Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Product data on pipe, fittings, gaskets, and bolts. Include dimensions, specifications, and manufacturer. Provide pipe and valve application schedule.
- C. Provide product data, including but not be limited to dimensions, specifications, manufacturer, installation and operation instructions, temperature and pressure ratings, end connections, and required clearances on piping specialties included in this Specification.
- D. Welder Certifications - Furnish the names of pipe welders and welding operators employed by the Contractor to perform the Work who have been qualified to use the welding procedures which have been qualified in accordance with the specified pressure piping codes or AWS or NFPA standards.
- E. Shop Drawings
  - 1. Where deviations from the Drawings and Specifications are proposed for any reason, submit shop drawings identifying proposed deviations showing layout of all piping, fittings,

materials, dimensions, and fabrication and installation details. Submit a comparison table of the specified features and ratings of the specified item and those of the proposed deviation to allow a direct comparison.

2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility. No dimensional or coordination check will be made.
3. The Contractor has the sole responsibility to review the Drawings, coordinate piping fabrication, and provide clearances and access for installation, maintenance and balancing of this Work, and Work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the piping.
4. Submit all layout shop drawings on not less than ¼ inch equals 1 foot scale drawings.

#### 1.05 REFERENCES

- A. Division 1 - Quality Control: Requirements for references and standards.
- B. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- C. ANSI C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
- D. ASME B16.3 - Malleable Iron Threaded Fittings.
- E. ASME B16.5 - Steel Pipe Flanges and Flanged Fittings
- F. ASME B16.9 - Factory-Made Wrought Steel Buttwelding Fittings
- G. ASME B16.15 - Cast Bronze Threaded Fittings
- H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- I. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.
- J. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- K. ASME B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings.
- L. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- M. ASME B16.39 - Pipe Unions, Malleable Iron Threaded
- N. ASME-B31.1 - Power Piping.
- O. ASME B31.2 - Fuel Gas Piping.
- P. ASME B31.5 - Refrigeration Piping.
- Q. ASME B31.9 - Building Service Piping.
- R. ASME B36.10M - Welded and Seamless Wrought Steel Pipe
- S. ASME SEC IV - Construction of Heating Boilers.
- T. ASME SEC IX - Welding and Brazing Qualifications.
- U. ASTM A47 - Ferritic Malleable Iron Castings



- V. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- W. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- X. ASTM A105 - Forgings, Carbon Steel, for piping components.
- Y. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- Z. ASTM A181 - Forgings, Carbon Steel, for General Purpose Piping
- AA. ASTM A197 -Cupola Malleable Iron
- AB. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- AC. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile
- AD. ASTM B32 - Solder Metal.
- AE. ASTM B42 - Seamless Copper Pipe.
- AF. ASTM B62 - Composition Bronze or Ounce Metal Castings
- AG. ASTM B75 - Seamless Copper Tube
- AH. ASTM B88 - Seamless Copper Water Tube.
- AI. ASTM B306 - Copper Drainage Tube (DWV).
- AJ. ASTM B584 - Copper Alloy Sand Castings for General Applications
- AK. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AL. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.
- AM. AWS A5.8 - Specification for Brazing Filler Material
- AN. AWWA C651 - Disinfecting Water Mains.
- AO. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.
- AP. NFPA 30 - Flammable and Combustible Liquids Code
- AQ. NFPA 54 - National Fuel Gas Code.
- AR. NSF 61 - Domestic Water Pipe, Valves, and Fittings.
- AS. Mechanical Code of New York State-Latest Edition
- AT. Plumbing Code of New York State-Latest Edition
- AU. Fuel Gas Code of New York State-Latest Edition
- AV. FM - Factory Mutual Compliance

AW. UL - Underwriter's Laboratory Compliance

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.
- D. Protect all flange faces with wood, plastic or soft metal to prevent damage to parts.
- E. Protect all pipe threads from damage with plastic plugs or caps.
- F. Mark and identify all piping materials in accordance with the Reference Standards specified herein.

#### PART 2 - PRODUCTS

##### 2.01 GENERAL

- A. When two or more valves of the same type are used in the same service, furnish all valves of this type from the same manufacturer.
- B. Specific manufacturer's model numbers are cited in the following Piping Material Schedules to establish the desired quality and performance for each type valve or material. Equivalent products by other approved manufacturers are also acceptable. Approval shall be subject to review by the Architect/Engineer.

##### 2.02 HEATING HOT WATER PIPING

| Item   | Pipe Size             | Description                                                   | Manufacturer/<br>Model No.         |
|--------|-----------------------|---------------------------------------------------------------|------------------------------------|
| Pipe   | 2 inches and smaller  | Type L, hard drawn copper tubing, ASTM B88                    | Mueller<br>Industries<br>Wheatland |
|        | 2 ½ inches and larger | Schedule 40, seamless steel, ASTM A 53<br>Grade B             |                                    |
| Joints | 2 inches and smaller  | Lead-free solder, ASME B32; Water Soluble<br>Flux, ASTM B-813 | J.W.<br>Harris-Bridgit             |
|        | 2 ½ inches and larger | Welded Connections                                            |                                    |

| Item              | Pipe Size              | Description                                                                                                                                                                                                                                                                          | Manufacturer/<br>Model No.  |
|-------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Fittings          | 2 inches and smaller   | Cast copper alloy or wrought copper ASME B16.18 or ASME B16.22                                                                                                                                                                                                                       | Nibco                       |
|                   | 2 ½ inches and larger  | Standard Weight, Seamless steel, butt welded, ASTM A234                                                                                                                                                                                                                              | Weldbend                    |
| Flanges           | 2 ½ inches and larger  | 150#, forged steel, weld neck, bore to match pipe ID, ASTM A181                                                                                                                                                                                                                      | Weldbend                    |
| Bolts             | All sizes              | Alloy Steel, Hex Head Bolts and Nuts, ASTM A307 Grade B                                                                                                                                                                                                                              |                             |
| Unions            | 2 inches & smaller     | Wrought copper, solder unions, ASME B16.22                                                                                                                                                                                                                                           | Nibco                       |
| Dielectric Unions | 2 1/2 inches & smaller | Dielectric Type, Copper to Steel                                                                                                                                                                                                                                                     | Watts Regulator Series 3000 |
| Gaskets           | All Sizes              | Spiral wound metallic gaskets                                                                                                                                                                                                                                                        | Flexitallic Style LS/LSI    |
| Ball Valves       | 2 inches & smaller     | Two-piece, full-port, soldered ends, bronze body, type 316 stainless-steel vented ball and stem, reinforced TFE seats, 150 psig SWP and 600-psig CWP ratings. MSS SP-110, ASTM B 584 Alloy C84400, ASME B1.20.1                                                                      | Nibco S-585-70-66           |
| Check Valves      | 2 inches & smaller     | Class 125, Y-pattern swing type, soldered connections, bronze body with TFE seat disc. MSS-SP80, ASTM B 62                                                                                                                                                                           | Nibco S413-Y                |
|                   | 2 ½ inches & larger    | Class 125, swing-type, flanged connections, cast iron body with bronze trim, non asbestos gasket. MSS-SP71, ASTM A-126 Class B                                                                                                                                                       | Nibco F918-B                |
| Butterfly Valves  | 2 ½ inches & larger    | Full-lug type with ductile-iron body, one-piece Type 416 stainless-steel stem, copper bushing, aluminum-bronze disc, and molded-in EPDM seat. Valve sizes 2 ½" through 6" shall have lever lock operator; valve sizes 8" and larger shall have weatherproof gear operator. MSS SP-67 | Nibco LD-2000-3/5           |

## PART 3 - EXECUTION

## 3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Unless otherwise shown, route piping in the most direct manner parallel to building lines in accordance with the Drawings. Group piping whenever practical at common elevations.
- B. Accurately align, support and connect piping without forcing.
- C. Locate piping so that access to and clearance around equipment, and minimum piping headroom of 7 feet is maintained, except where otherwise shown.
- D. Space piping so that insulation and flanges, if any, have at least 1 inch clearance after maximum movement.
- E. Where pipe elevations are not shown, pitch supply and return lines to positive drain points and/or coils.

- F. Provide accessible flanges or union connections on the supply and return connections of terminal equipment and other items which must be disconnected for maintenance. Where unions are furnished as an integral part of the equipment, additional unions are not required unless required for access to or removal of components. Arrange equipment piping connections so that maintenance can be made without removing large sections of pipe or relocating the equipment.
- G. In Domestic Water Systems, connect branch lines to the top of the line. For all other liquid systems, connect branch lines to the bottom or lower half of the line, preferably the bottom.
- H. Use fittings for all changes of direction. Bending of steel pipe is not permissible.
- I. Clean all piping materials before installation to remove grease, loose dirt, mill scale and other foreign matter.
- J. Provide air vents at all high points of water piping, and valved drains at all low points of water piping for complete venting, draining and flushing of the piping system. Locate and provide air vents at multiple high points that are necessary to prevent air binding in the piping system. Install additional air vents and drains if directed by the Architect/Engineer, at no cost to the Owner. As a minimum provide drains and air vents
  1. In each section of piping separated by valves.
  2. On all coils.
  3. For each riser, where riser or runout to riser has a valve installed.
  4. In low point of piping to each down fed convector or radiator.
- K. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide loops, pipe offsets and anchors.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- M. Install gate or ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.
- N. Sleeve pipes passing through partitions, walls and floors.
- O. Identify piping under provisions of "Mechanical System Identification" Specification.
- P. Provide escutcheons at all locations where piping installed exposed to view penetrates wall, partitions, floors and ceilings.
- Q. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- R. Install flexible connectors at inlet and discharge connections of pumps and other vibration producing equipment.
- S. Install strainers on the supply side of each control valve, pressure regulating valve, solenoid valve, trap, and elsewhere as indicated.
- T. For pressurized liquid piping systems installed horizontally make reductions in pipe sizes using eccentric reducer fitting installed with the level side up to allow air venting.
- U. For all nipples up to and including six inches in length provide extra-heavy shoulder type. For all nipples over six inches in length provide corresponding material, quality and thickness as the

pipe on which they are used. Do not use close nipples. Provide nipples with designation mark of the manufacturer conforming to the ASTM pipe specifications for system served.

- V. Make connections to all cooling and heating units with single or multiple cooling or heating coils in accordance with the manufacturer's instructions and labeling on equipment
- W. For pressures over 15 psig, use nipples and caps instead of plugs for permanent closures. Plugs in equipment provided by equipment manufacturers are acceptable.
- X. Do not install piping above electrical panels. Route piping around panels.

### 3.02 THREADED CONNECTIONS

- A. Ream pipe ends to remove burrs.
- B. Use only standard ANSI taper threads. Threads shall be full, sharp, clean, and free of fins and burrs.
- C. Apply joint sealing tape or paste to male threads only. Do not use paste on compressed air lines. When sealing fuel oil piping, use a thread-sealing compound suitable for oil when making up joints. When sealing natural gas piping, use a thread-sealing compound suitable for natural gas when making up joints.
- D. Do not use close or short nipples of a size where the length of unthreaded pipe is less than the width of a pipe wrench.
- E. Thredolets or similar code-approved fittings may be used for branch connections.
- F. Provide unions at all threaded valve locations to facilitate the removal of the valve.
- G. Joint Sealing Compound; Hercules, RectorSeal or approved equal.

### 3.03 WELDED CARBON STEEL CONNECTIONS

- A. Perform welding using qualified welders and procedures following specified reference standards.
- B. Do not use mitered welds for elbows.
- C. Welded branch connections may be used in place of welding tees provided that requirements of the applicable ASME Code for pressure piping, B31.1 and/or B31.9 are met.
- D. Weldolets or similar code-approved fittings may be used for branch connections.
- E. Qualifications of welders, welding procedures, performance of welders and welding operators are required complying with the requirements of ASME B31.9 and ASME Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by code on file and available for inspection.
- F. Whenever welding is done close to walls, floors or building structure, thoroughly clean the surfaces of weld splatter. Remove weld splatter from the surface of all welds, pipe and pipe supports.
- G. Provide long radius pattern for welding elbows unless otherwise shown on the Drawings.
- H. Examine and inspect welded pipe joints as follows:

1. Visually examine all welded pipe joints for imperfections using qualified representatives. Submit qualifications to the Architect/Engineer.
2. Make available to the Architect/Engineer records of visual examinations upon request.
3. Remove weld defects by grinding or chipping and repair or replace joints in accordance with approved procedures.
4. Make shop and field welded joints available to the Owner for nondestructive inspection and examination upon request.

#### 3.04 FLANGED CONNECTIONS

- A. Arrange flange bolt holes to straddle the pipe vertical and horizontal centerlines, and match the orientation of mating flanges.
- B. Install piping to equipment without strain.
- C. Provide gaskets at all flanged connections suitable for the design and temperature of the fluid contained, and in accordance with Part 2 of this Section.
- D. Mate flat face flanges together and raised face flanges together.

#### 3.05 COPPER TUBING CONNECTIONS

- A. Provide soldered or brazed in accordance with Part 2 of this Section.
- B. Make soldered and brazed connections in accordance with the procedures in the current edition of the Copper Tube Handbook of the Copper Development Association.
- C. Qualifications of brazers, brazing procedures, and performance of brazers and brazing operators are required in compliance with the requirements of ASME B31.1, ASME B31.9, and the Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by the code on file and available for inspection.
- D. Make solder joints on all copper water piping with 95/5 solder. Absolutely no lead-based solder will be accepted.
- E. Clean joints thoroughly before soldering.
- F. Remove excess solder and flux with a cloth or brush to leave a uniform clean fillet.
- G. For refrigeration copper tubing connections, comply with ASME B31.5. Make brazed joints on all refrigeration piping.

#### 3.06 CONNECTIONS OF DISSIMILAR METALLIC MATERIALS

- A. Isolate connections between dissimilar metallic materials using dielectric connections. Use dielectric unions or flanges that provide a complete isolation of the two ends, including bolts for flanges, using materials suitable for the design pressure, temperature and fluid contained.

#### 3.07 VALVES

- A. Provide valves of the same size as the pipe in which they are installed, unless shown otherwise on the Drawings. At pumps, match valve size to pipe size and not pump connection size.
- B. Install valves with the stem on or above the horizontal. Install valves with the stem horizontal if requirements of headroom, access or chain operation must be met.

- C. Pack valves and adjust glands before final acceptance.
- D. Install valve extension stems or chain operators where the center of valve hand wheels is more than 6 feet-6 inches above the floor and valve is 2 ½" and larger. Provide chain hooks where required to prevent fouling of chains on equipment and to clear walkways. Terminate chains approximately 3 feet-6 inches above the floor. Provide worm gear operators or impact hand wheels for all valves 6 inches and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation and a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation.
- F. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- G. Locate valves for easy access and provide separate support where necessary.
- H. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Lift Check Valves: With stem upright and plumb
- I. Install butterfly valves with stems horizontal to allow support for the disc and the cleaning action of the disc.
- J. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.
- K. Install balancing valves with lengths of straight pipe upstream and downstream of valve as per manufacturer's instructions such that calibrated accuracy is maintained. As a minimum provide straight lengths as per the following table;

REQUIRED STRAIGHT LENGTHS

| Valve Size | Upstream<br>(In Pipe Diameters) | Downstream<br>(In Pipe Diameters) |
|------------|---------------------------------|-----------------------------------|
| ½"-3"      | 3                               | 1                                 |
| 4"-12"     | 5                               | 2                                 |

- L. Chain wheel Actuators- Valve actuation assembly with sprocket rim, brackets, and chain.
  - 1. Sprocket rim with Chain guides: Ductile Iron (Aluminum for applications exposed to weather), of type and size required for valve.
  - 2. Brackets: Type, number, size, and fasteners required to securely mount actuator on valve.
  - 3. Chain: Stainless steel, of size required to fit sprocket rim.
  - 4. Manufacturers:
    - a. Babbitt Steam Specialty Co.
    - b. Roto Hammer Industries

### 3.08 CONTROL VALVE INSTALLATION

- A. Install all control valves so that the stem position is not more than 60 degrees from the vertical up position.
- B. Install valves in accordance with the manufacturer's recommendations.

- C. Install control valves so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes, ducts and/or equipment.
- D. Install isolation valves at control valves such that control valve body may be serviced without draining the supply/return side piping system. Install unions at all connections to screwed type control valves.

### 3.09 PRESSURE TESTING, FLUSHING AND CLEANING

- A. Pressure test piping systems in accordance with applicable codes and as described herein.
- B. Pressure testing - Schedule pressure testing so that it may be witnessed by the Architect/Engineer, Owner, or their representative. Perform tests in accordance with the following procedures:
  - 1. Before testing, complete the installation of each pipe line, including final supports, hangers and anchors. Perform testing before insulation or paint is applied for examination during the test. Clean piping and equipment of metal cuttings and foreign matter as they are installed.
  - 2. Codes - Pressure test piping to assure integrity of material and workmanship in accordance with the applicable ASME Code for pressure piping (B31) and New York State Code.
  - 3. Protection of Equipment - Protect equipment, instruments and piping specialties which are not included in the test by either disconnecting from the piping and blanking off the end of the pipe with a blind flange, plug or cap, or isolating by insertion of a line blind or spool piece as required. Disconnect pneumatic control lines and close all openings.
  - 4. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
  - 5. Piping may be tested in sections or circuits as required for the progress of the work.
  - 6. Provide all systems to be pressurized with the appropriate gauges, certified calibrated by the manufacturer, and pressure-relieving devices.
  - 7. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test. Do not allow test pressure to exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
  - 8. Records - Provide records of all tests showing line designation, test pressure, ambient temperature, date of test, retests and signature of witness.
- C. Pneumatic Test Procedures - Perform pneumatic testing in accordance with ASME B31.9
  - 1. Prior to application of full pneumatic test pressure, perform a preliminary test at 10 psig for a minimum of ten (10) minutes to reveal any major leaks.
  - 2. After the preliminary test, apply pressure gradually in stages until test pressure is reached.
  - 3. Test durations:
    - a. For all systems the minimum test duration is that required to thoroughly examine the system for leaks.
    - b. Natural gas piping; Maintain test pressure for a minimum of one hour but not less than ½ hour for each 500 cubic feet of pipe volume. After test, purge the entire system of test gas.
    - c. For all other systems maintain test pressure for a minimum of ten (10) minutes without fluctuation.
  - 4. Check all joints, valves, etc. for leaks with a thick soap-water solution.
  - 5. Repair leaks as specified under "Repair of Line Leaks".
  - 6. Repeat pneumatic test until there are no leaks.
  - 7. Ensure that adequate protection is provided to prevent injury to persons or property during leak testing.



8. Test systems to the pressure indicated under "Pressure Testing Schedule"
- D. Hydrostatic Test Procedures - Perform hydrostatic testing in accordance with ASME B31.9.
  1. Perform test using the pressure indicated under "Pressure Testing Schedule"
  2. After hydrostatic test pressure has been applied for at least two hours, examine piping, joints, and connections for leakage while maintaining test pressure. Repeat hydrostatic test until there are no leaks.
  3. Repair leaks as specified under "Repair of Line Leaks"
- E. Service Testing - Perform service testing in accordance with ASME B31.9.
  1. For gases and steam and condensate service not over 15 psig, and for nontoxic, noncombustible, nonflammable liquids at pressures not over 100 psig and temperatures not over 200 degrees F a system test with the service fluid is acceptable. This exemption does not apply to natural gas piping.
  2. Bring the piping system up to operating pressure gradually with visual examination at a pressure between one-half and two-thirds of design pressure. Make a final examination at operating pressure.
  3. Repair leaks as specified under "Repair of Line Leaks"
  4. Repeat service test until there are no leaks.
- F. Repair of Line Leaks - Comply with the following procedures for repair of leaks. In each case retest after repairs are made.
  1. Soldered/Brazed Joints - Remove solder/brazing alloy and reapply with proper flux.
  2. Flanged Joints - Check to determine flange end alignment and that all bolts are uniformly tightened with the required torque. If leak persists, depressurize the line, remove gasket, examine flange end face, and insert new gasket.
  3. Threaded Joints - Tighten joint to a required torque. If leak does not stop, replace pipe and/or fittings. Do not use pipe dope, cement or seal weld to stop pipe leaks.
  4. Gasketed Joints - Remove existing gasket and insert new gasket.
  5. Welded Steel Joints - Repair pipe in accordance with applicable ASME B31 code.
  6. Leaks in Material - Leaks located in pipe or fitting material require the replacement of that section of pipe or fitting and a repeat of the entire system using the complete procedure required for that system. Caulking, welding or epoxy is not permitted. Repair all damage caused by leaks.
- G. Flushing - Complete pressure testing requirements prior to flushing. Performance of the flushing may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of flushing any system. Perform system flushing in accordance with the following procedures:
  1. Flush all main and branch steam and liquid piping systems after pressure testing is complete with new potable water while draining the system at all low points. Isolate all connected equipment and flush individually.
  2. Flushing for piping and equipment will be considered complete when water samples taken at all low points indicate clear discharge-with no visible solids. If not clear, continue flushing and sampling until discharge is clear.
- H. Cleaning - Complete flushing requirements prior to cleaning. Performance of the cleaning may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of cleaning any system. Perform system cleaning in accordance with the following procedures:
  1. Clean all steam and condensate lines by blowing them out with live steam. Discharge steam and condensate from each main and branch safely to atmosphere for a minimum of five minutes.
  2. Clean all compressed air, instrument air, and fuel oil lines with oil-free dry compressed air at design pressure through each section so that they are blown free of dirt and debris.

3. Clean domestic water lines by flushing with water until effluent is visibly as clean as the flushing medium.
4. Clean hot water/chilled water lines as described below:
  - a. When flushing discharge is clear, fill piping systems with water and sufficient approved alkaline cleaning material to remove dirt, oil and grease. Include all connected equipment in the cleaning.
  - b. Vent system and place in operation, with automatic controls operating at set point temperature or an operating temperature designated by the Architect/Engineer. Circulate the solution through the system for a minimum of 4 consecutive hours.
  - c. After 4 hours, drain system and flush with clean water until the pH at the farthest drain matches the clean water input. Keep strainers unplugged during the cleaning operations. Refill system with clean water.
5. Clean temporary pump strainers and strainers at coils, etc. every 2 hours periodically during cleaning procedures. Do not remove temporary strainers until all cleaning steps are completed and the operation of the system indicates that the system is free of all foreign matter.
6. Blow out all piping and equipment after cleaning and final flushing is completed and the system is drained with clean dry instrument air for a minimum of 15 minutes or until all water is expelled from the system. Upon completion seal the system by closing all drains and vents.
7. Following the Architect/Engineers approval of the above flushing and cleaning procedures, immediately fill each system and chemically treat and monitor in accordance with the "Chemical Treatment Systems" specifications.

I. Pressure Testing Schedule:

| Service                           | Test Type   | Design Operating Pressure (psig) | Test Pressure (psig)                                          |
|-----------------------------------|-------------|----------------------------------|---------------------------------------------------------------|
| Heating Hot Water Supply & Return | Hydrostatic |                                  | 1.5 times maximum working pressure, but not less than 100 psi |

3.10 PAINTING

- A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Paint in accordance with the requirements of the "Painting" Specification Section.

**END OF SECTION 232000**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
- B. Condensate Drain.

## 1.02 RELATED SECTIONS

- A. Section 230529 - Pipe Hangers and Supports
- B. Section 230555 - Mechanical System Identification
- C. Section 230700 - Piping Insulation.

## 1.03 REFERENCES

- A. Section 014500 - Quality Control: Requirements for references and standards.
- B. ASTM D 1784 - Rigid Vinyl Compounds.
- C. ASTM D 1785 - PVC Plastic Pipe, Schedule 40
- D. ASTM D 2466 - PVC Plastic Fittings, Schedule 40
- E. ASTM D 2665 - PVC Drain, Waste, and Vent Pipe and Fittings
- F. ASTM D 2564 - Solvent Cements for PVC Pipe and Fittings
- G. ASTM D 2321 - Underground Installation of Thermoplastic Pipe (non-pressure applications)
- H. ASTM F 1668 - Procedures for Buried Plastic Pipe
- I. ASTM F 1866 - Fabricated PVC DWV Fittings
- J. NSF Standard 14 - Plastic Piping Components and Related Materials.
- K. NSF Standard 61 - Drinking Water System Components - Health Effects.

## 1.04 SUBMITTALS FOR REVIEW

- A. Section 013300 - Submittals: Procedures for submittals.
- B. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

## 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with State of New York and Town code.
- B. Identify pipe with marking including size, ASTM material classification and ASTM specification.

## 1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with the State of New York and the Town code.

## 1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Section 016500 – Product Delivery, Storage, and Handling: Transport, handle, store, and protect products.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Section 014536 – Environmental Quality Control: Moisture control affecting products on site.

## PART 2 - PRODUCTS

## 2.01 CONDENSATE DRAIN PIPING (DIAMETER LESS THAN OR EQUAL TO 1")

- A. Copper Type L Pipe and Fitting System.
- B. Pipe and fittings shall be manufactured from Type L Copper.
- C. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.
- D. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.
- E. Testing with or transport/storage of compressed air or gas in Copper pipe or fittings shall not be permitted.
- F. The system is intended for pressure drainage applications where the temperature will not exceed 140°F.

## 2.02 CONDENSATE DRAIN PIPING (DIAMETER GREATER THAN 1")

- A. Type L copper solid wall pipe and type L copper fitting system.
- B. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.
- C. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 14.
- D. Testing with or transport/storage of compressed air or gas in copper pipe or fittings shall not be permitted.
- E. The system is intended for non-pressure drainage applications where the temperature will not exceed 140°F.

## 2.03 PVC SCHEDULE 40 SOLID WALL PIPE AND PVC DWV FITTING SYSTEM.

- A. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454 per ASTM D 1784.
- B. PVC Schedule 40 pipe shall be iron pipe size (IPS) conforming to ASTM D 1785 and ASTM D 2665.

- C. Injection molded PVC DWV fittings shall conform to ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866.
- D. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.
- E. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 14.
- F. Testing with or transport/storage of compressed air or gas in PVC pipe or fittings shall not be permitted.
- G. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668.
- H. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564.
- I. Primer shall conform to ASTM F 656.
- J. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVC compounds.
- K. The system is intended for non-pressure drainage applications where the temperature will not exceed 140°F.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Section 013100 - Project Management and Coordination: Verification of existing conditions before starting work.

#### 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

#### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and the requirements of the Plumbing Code of New York State.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls. Effect changes in size with reducing fittings.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to fittings. Refer to Section 230700.
- F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083113 - Access Doors and Frames.

- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H. Sleeve pipes passing through partitions, walls and floors.
- I. Identify piping under provisions of Section 230555.

#### 3.04 APPLICATION

- A. Install unions downstream at equipment or apparatus connections.

#### 3.05 ERECTION TOLERANCES

- A. Section 014500 - Quality Control: Tolerances.
- B. Establish invert elevations, slopes for drainage to  $\frac{1}{4}$  inch per foot minimum. Maintain gradients.

#### 3.06 FIELD QUALITY CONTROL

- A. Drainage System: Test plug all system openings with the exception of the system's highest point. Fill system with water to the point of overflow and subject the highest point to 10-foot head of water. The system shall be considered tight if the pressure is held for not less than 30 minutes without signs of leakage.

**END OF SECTION 232001**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section describes the thermometers and pressure gauges for monitoring liquids and gases in mechanical equipment and systems to be provided as part of the Work.

## 1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's catalog sheets and specifications.
- B. Certification - Submit certified accuracy for all products specified.

## PART 2 - PRODUCTS

## 2.01 APPROVED MANUFACTURERS

- A. Subject to compliance with the specifications, provide products from the following manufacturers.
  - 1. Weksler Instruments
  - 2. H.O. Trerice Co.
  - 3. Taylor Instrument Co.
  - 4. Moeller Instrument Co.

## 2.02 THERMOMETERS FOR MEASURING LIQUID TEMPERATURE

- A. Thermometer Scale Ranges: Provide thermometers, with scale range 1-1/2 times the actual working temperature required for the particular application, as approved. Provide maximum of 2 degrees between graduations and 10 degrees between numerals. When scale ranges are in excess of 100 degrees, the maximum range between numerals may be 20 degrees, or as otherwise approved for the particular application.
- B. Thermometers: Provide red reading or magnified column industrial type, with wide angle of vision. Thermometers containing mercury are not permitted. Design and materials as follows:
  - 1. Case: Heavy one piece cast aluminum or extruded brass construction, with a clear acrylic plastic or glass lens. (Adjustable Angle)
  - 2. Scale: White enamel background with bold black figures and graduations. Provide 7 inch scale length for installation in piping and 9 inch length for installation in tanks and similar equipment.
  - 3. Separable Thermowell: Provide thermometers with matching brass (for water service) or stainless steel (for steam service) separable socket thermometer wells in accordance with manufacturer's recommendations.
  - 4. Stem: Swivel neck design.
  - 5. Locking Device: Adjustable case locknut and adjusting screw function independently to provide full 360 degree positioning of thermometer case and stem to provide optimal visibility.

## 2.03 PRESSURE GAUGES

- A. Provide pressure gauges with 4½" dial size with a flangeless stainless steel case, stainless steel friction ring and acrylic window. Provide brass movement with a bronze bourdon tube and brass socket.
- B. Dial face: white with black figures; pointer with zero adjustment screw.
- C. Accuracy: ±1% of scale range, ASME B40.1 Grade 1A.

- D. Approved manufacturers: Terice No. 620 or approved equal.
- E. Provide stainless steel needle valves for all pressure gauges, Terice or approved equal.
- F. Provide steel coil siphons for gauges on steam service, Terice No. 885 or approved equal.
- G. Provide pressure snubbers for gauges on any service where pressure surges or pulsations are possible, Terice No. 872 or approved equal.

#### 2.04 COMBINATION PRESSURE/TEMPERATURE TEST STATIONS

- A. Provide test stations where shown on the Drawings.
- B. Test stations: "Pete's Plug II", 1/4" solid brass fitting to receive either a 1/8" OD temperature or pressure probe with two valve cores of Neoprene (Max 200°F at 500 PSI), or Nordel (Max 275°F at 500 PSI). Provide fitting with a color coded cap strap with gasket, rated at 1000 PSI at 140°F. Provide material compatible with piping system that test station is installed in as per manufacturer's recommendations.
- C. When installed in insulated lines, test connection provide Pete's XL plug, extended stem type.
- D. Supply to the Owner, upon completion of the Work, a pressure and temperature test kit consisting of a 0-100 PSI, 0-230 ft. of water pressure gauge with a Number 500 gauge adapter attached, one 25-125°F and one 0-220°F pocket testing thermometer, an extra number 500 gauge adapter, and a protective carrying case.
- E. Approved Manufacturer: - Pete's Plug II by Peterson Equipment.

#### 2.05 RANGES FOR TEMPERATURE AND PRESSURE GAUGES

|                 |           |              |
|-----------------|-----------|--------------|
| Thermometer     | Hot Water | 60° to 240°F |
| Pressure Gauges | Hot Water | 0 to 60 psi  |

Note: Select the proper range so that the average operating pressure and temperature falls approximately in the middle of the scale selected. It is the Contractor's responsibility to determine the average operating range and select the scale appropriately.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Thermometers:
  1. Install thermometers, of type and scale range as required for the particular application, at locations indicated on the Drawings or as required by the Specifications.
  2. Install thermometers of type, scale range, and with case style, as required for the particular application, at locations indicated on the Drawings or Specified. Angle each thermometer so that it can be easily read from a standing position at floor level.
  3. Where thermometers are installed in piping with insulation 2 inches thick or greater, provide thermometer wells with extension necks. Omit extension necks where thermometers are used on bare pipe or pipe with insulation less than 2 inches thick.
  4. Where thermometer wells are installed in piping 2 ½ inches and smaller, increase the pipe size by a minimum of one pipe diameter to avoid restricting the flow in the pipe or install thermometers at elbows such that the stems protrude into the flowing medium.



- B. Pressure Gauges:
  - 1. Install gages, of type and scale range as required for the particular application, at locations indicated on the Drawings or as required by the Specifications.
  - 2. For measuring liquid pressure, install gauges complete with stop cocks and drain cocks.
  - 3. Install siphon loops on pressure gauges when installing in steam lines.
- C. Pressure Snubbers and Impulse Dampers:
  - 1. Install "pressure snubbers" in the piping connections to all gages installed in the suction and discharge piping connections to close coupled and base mounted circulating pumps driven by motors under 10 HP.

**END OF SECTION 232003**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This Section describes the hydronic specialties, including Expansion Tanks, Air Separators, Triple Duty Valves, Suction Diffusers, Automatic Water Tempering/Mixing Valves, Water Hammer Arrestors and Thermostatic Radiator Valves for hydronic heating and cooling piping systems.

## 1.02 REFERENCES

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

## 1.03 SUBMITTALS

- A. Product Data: Provide product data for manufactured products and assemblies required for the Work. Include component sizes, rough-in requirements, service sizes and finishes. Include product description, model and dimensions.
- B. Submit manufacturer's instructions for maintenance and repair.
- C. Provide a valve and specialty application schedule.

## 1.04 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include installation instructions, assembly views, lubrication instructions and replacement parts list.

## 1.05 RELATED WORK

- A. Section 232000 - Pipe, Valves and Fittings

## 1.06 QUALIFICATIONS

- A. Companies specializing in making products specified with at least 5 years of experience and products that have been on the market for at least 3 years.

## PART 2 - PRODUCTS

## 2.01 ASME PARTIAL BLADDER TYPE EXPANSION TANKS

- A. Manufacturers:
  - 1. Taco, Inc; Model PAX (size and capacity as called for on plans)
  - 2. ITT Bell & Gossett
  - 3. Amtrol Inc
  - 4. Approved equal.
- B. Construction: Welded steel, designed, tested and stamped in accordance with ASME (BPV code sec VIII, div 1); supplied with National Board Form U-1, rated for working pressure of 125 psi , with flexible seamless heavy duty butyl rubber bladder. (optional 150 psi ) All wetted components to be fabricated of FDA approved materials. Bladder shall be able to accept the partial volume of the expansion tank and shall be removable and replaceable. The bladder shall be connected to the top of the tank via a hose/tube that with distribution holes that facilitate even expansion of the bladder.

- C. System connection shall be via a ½ inch 304 stainless steel NPT connection on the top of the tank. A Schrader valve fitting shall be installed at the top of the tank to allow external pressurization of the bladder. Valve shall be protected by a 1½ "coupling welded to the tank.
- D. Accessories: Pressure gage (field installed in adjacent piping by others) and air-charging fitting; precharge to pressure indicated on plans.

## 2.02 AIR AND DIRT SEPARATORS

- A. Manufacturers:
  - 1. Taco, Inc; 4900 (size and capacity as called for on plans)
  - 2. Spirotherm.
  - 3. Flamco
  - 4. Approved equal.
- B. Air and dirt removal device shall be constructed of steel. It shall be designed, fabricated and stamped per ASME Section VIII Division 1 with a maximum working pressure of 125 psi at 270°F/. Manufacturer shall be holder of ASME U stamp. Optional 250 psi and 150 psi ASME units.
- C. Units up to three 3-inch in size shall be provided with threaded connections as standard. Units four 4-inch and larger shall be provided with flanged system connections as standard. Inlet and outlet connections to be inline with piping system. Both inlet and outlet to be in the same horizontal and vertical planes.
- D. Each air and dirt removal device shall be equipped with a brass conical shaped air venting chamber designed to minimize system fluid from fouling the venting assembly. The air vent shall be able to be closed to allow flushing and purging of dirt via side port without dirt passing through vent on initial system fill.
- E. A brass flushing cock shall be located on the side of each separator to facilitate system fast-fill and removal of the floating impurities from the air system interface within the separator.
- F. A blow down valve shall be provided by the unit manufacturer on the bottom of each unit to allow blow down and cleaning. On units 2 ½" and smaller the valve and all of its fittings shall be 1". On units three 3" and larger the valve and all openings shall be 2".
- G. The air and dirt removal device shall remove air down to 18 microns and shall remove dirt/debris down to 35 microns. The unit shall be 100% efficient at removing dirt down to 90 microns in 100 passes or less.
- H. The unit manufacturer shall provide the owner and design engineer third party independent test data certifying that their unit performs to the above standards. Suppliers not providing these independent performance test results will not be acceptable.
- I. The air and dirt separator shall employ the use of high surface area pall rings to achieve optimal separation of air and dirt with minimal pressure drop. The pall rings shall be made of stainless steel. Stainless steel will be the only acceptable material used for suppressing turbulence and increasing surface area for high efficiency air and dirt removal. Inferior materials of construction such as copper for the straining medium will not be acceptable.
- J. Manufacturer must have at least 15 years of experience with microbubble coalescing and dirt removal technology.

- K. (OPTIONAL) The unit shall be manufactured with a removable cover to facilitate removal, inspection, and cleaning of the pall ring basket. The entire pall ring basket shall be constructed of stainless steel. For safety and ease of service the unit shall be accessed from the top and the pall ring basket shall be accessed as one complete assembly housed in a stainless steel cage.

### 2.03 TRIPLE DUTY VALVES

- A. Furnish and install as shown on Drawings, a valve designed to perform the functions of a center guided nonslam check valve, shutoff valve and calibrated balancing valve.
- B. Heavy-duty cast iron construction.
- C. 2" and smaller: NPT connections per ANSI B1.20.1-83 suitable for 175 psi working pressure for operating temperatures up to 250°F.
- D. 2 1/2" and larger: 125 psi ANSI flanged connections suitable for 175 psi working pressure connections for operating temperatures up to 250°F.
- E. Fit valve with a bronze seat, replaceable bronze disc with EPDM seat insert, stainless steel stem, and chatter preventing stainless steel spring. Design to permit repacking under full system pressure.
- F. Provide Cv rating at every 10% increment opening for read-out of flow determination and system pressure drop.
- G. Equip with brass readout valves (with integral check valve) to facilitate taking differential pressure readings across the orifice for accurate system balance. Manufacture valve at an ISO 9001 approved facility.
- H. Approved manufacturers:
  - 1. ITT Bell & Gossett
  - 2. Taco, Inc.
  - 3. Watts

### 2.04 SUCTION DIFFUSERS

- A. Furnish and install as shown on the Drawings, angle pattern flow straightening fitting equipped with a combination diffuser strainer-orifice cylinder, flow straightening vanes, start-up strainer and adjustable support foot. Design the combination diffuser-strainer-orifice cylinder to withstand pressure differential equal to the system pump shutoff head with a free area equal to five times the cross section area of the pump suction opening. Provide flow straightening vanes no less than 2 1/2 times the diameter of the system pump suction connection in length.
- B. Cast Iron NPT and Flanged Models Rated for a Maximum Working Pressure of 175 PSIG.
- C. 2" and smaller: Cast iron flow straightening fitting with NPT system and NPT pump connections.
- D. 2 1/2" and larger: Cast iron flow straightening fitting with flanged system and flanged pump connections.
- E. Stainless steel combination diffuser-strainer-orifice cylinder with 3/16" diameter perforations to protect the system pump. Full length stainless steel flow straightening vanes to provide nonturbulent flow to the suction side of the system pump. Bronze start-up strainer with 16 mesh. Construct so that all internal components are replaceable.

- F. Approved manufacturer: ITT Bell & Gossett.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions and as shown on the Drawings.
- B. Air separator and expansion tank to be installed on the suction side of the system pumps. Expansion tank to be tied into system piping in close proximity to air separator and system fill line.
- C. Provide all necessary steel supporting members to support the expansion tank in an approved manner. Support vertical tanks with steel legs or base. Support horizontal tanks with steel saddles.
- D. Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.
- E. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.
- F. Support pump fittings with floor mounted pipe and flange supports.
- G. Provide radiator valves on water inlet to terminal heating units such as radiation, unit heaters, and fan coil units.
- H. Provide radiator balancing valves on water outlet from terminal heating units such as radiation, unit heaters, and fan coil units.
- I. Provide relief valves on expansion tanks.
- J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- K. Pipe relief valve outlet to nearest floor drain.

**END OF SECTION 232006**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This section describes the pipe specialties for piping systems including, but not limited, to the following:
  - 1. Drain Valves
  - 2. Pressure Reducing Fill Valves
  - 3. Pressure Relief Valves
  - 4. Strainers
  - 5. Air Vents
  - 6. Prefabricated Expansion Compensation Loops
  - 7. Escutcheons
  - 8. Flexible Stainless Steel Hoses
  - 9. Double Check Valves
  - 10. Dielectric Connections

## 1.02 REFERENCES

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

## 1.03 SUBMITTALS

- A. Product Data: Submit product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes and finishes. Include produce description, model and dimensions.
- B. Submit manufacturer's instructions for maintenance and repair.
- C. Submit a valve and specialty application schedule.

## 1.04 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include installation instructions, assembly views, lubrication instructions and replacement parts list.

## 1.05 RELATED WORK

- A. Section 232000 - Pipe, Valves and Fittings

## 1.06 QUALIFICATIONS

- A. Companies specializing in making products specified with at least 5 years of experience and products that have been on the market for at least 3 years.

## PART 2 - PRODUCTS

## 2.01 DRAIN VALVE

- A. Provide drain valves, ball type with  $\frac{3}{4}$  inch hose connector, at all low points of water systems, on strainers, and in all locations as shown on the Drawings. Provide minimum  $\frac{3}{4}$  inch drain size. Provide caps or plugs with chain at all drain and fill valves.

## 2.02 PRESSURE REDUCING FILL VALVE

- A. Provide a pressure reducing fill valve with built in strainer, by-pass and all separation valves for hot water heating system.
- B. Adjustable range of 10 TO 25 PSIG or 25 to 60 PSIG.
- C. Install pressure reducing valve with unions on inlet and outlet to facilitate removal.
- D. Approved Manufacturer: Bell & Gossett

## 2.03 PRESSURE RELIEF VALVE

- A. Make Up Water Systems:
  - 1. Engineered in accordance with Section IV of the ASME boiler and pressure code for heating boilers with capacities certified by the National Board of Boiler and Pressure Vessel Inspectors.
  - 2. Bronze body and EPDM diaphragm
  - 3. Rated for maximum operating temperature of 250 degrees F and maximum working pressure of 125 psig.
  - 4. Approved Manufacturer: Bell and Gossett
- B. Boilers:
  - 1. Furnished by boiler supplier and sized as per ASME Boiler and Pressure Vessel Code.

## 2.04 STRAINERS

- A. General:
  - 1. Provide strainers ahead of all pumps, automatic control valves, as specified for piping installations, as shown on the Drawings, and as required for proper functioning of equipment.
- B. Steam and Water Strainers
  - 1. "Y" type or "Basket" type, as shown on the Drawings.
  - 2. Provide a strainer screen blow down valve the full size of the blow-off tapping for each strainer. Provide gate valves for steam service and ball valve with ½ inch hose end for water service.
  - 3. Stainless steel strainer screens with perforations as follows:

| Pipe Size<br>(Inches) | Water Service<br>Perforations (Inches)                  | Steam Service<br>Perforations (Inches) |
|-----------------------|---------------------------------------------------------|----------------------------------------|
| Thru 4                | 1/16<br>(except at cooling tower<br>pumps shall be 1/8) | 1/32                                   |
| Over 4                | 1/8                                                     | 3/64                                   |

- 4. Select the length of the nipple connecting the blow-off valve to the strainer basket flange so that the blow-off valve is clear of the insulation.
- 5. Select strainers with bodies compatible with connected piping from the following schedule for the service intended.

| Size                | Manufacturer            | Strainer Type | Model No. | Description                                                 |
|---------------------|-------------------------|---------------|-----------|-------------------------------------------------------------|
| 2 inches & smaller  | Mueller Steam Specialty | Y             | 11M       | Cast iron body, threaded ends, ANSI Class 250               |
| 2 inches & smaller  | Mueller Steam Specialty | Y             | 358S      | Bronze body, soldered ends, ANSI Class 125, for copper pipe |
| 2 ½ inches & larger | Mueller Steam Specialty | Y             | 758       | Cast iron body, flanged ends, ANSI Class 125                |
| 2 inches & smaller  | Mueller Steam Specialty | Basket        | 125       | Cast iron body, screwed ends, ANSI Class 125                |
| 2 inches & smaller  | Mueller Steam Specialty | Basket        | 125B      | Bronze body, screwed ends, ANSI Class 150, for copper pipe  |
| 2 ½ inches & larger | Mueller Steam Specialty | Basket        | 166       | Cast iron body, flanged ends, ANSI Class 250                |

## 2.05 AIR VENTS

### A. Automatic Air Vents:

1. Float actuated high capacity air vent designed to purge free air from the system and provide shutoff at pressures up to 150 psig at a maximum temperature of 250 degrees F. Design to prevent air from entering the system if system pressure drops below atmospheric pressure and to purge free air at pressures up to 150 psig during normal system operation.
2. Cast iron and fitted with components of stainless steel, brass, and EPDM.
3. Provide a shutoff ball valve before the automatic air to isolate the air vent from the system.
4. Approved Manufacturer: ITT Bell & Gossett Model 107A.

### B. Manual Air Vents:

1. ½ inch ball valves with ½ inch hose ends.

## 2.06 PREFABRICATED EXPANSION COMPENSATION LOOPS

- A. Provide flexible expansion loops of size and type noted on Drawings.
- B. Two flexible sections of hose and braid, two 90 degree elbows, and a 180 degree return assembled in such a way that the piping does not change direction, but maintains its course along a single axis.
- C. Factory supplied, center support nut located at the bottom of the 180 degree return, and a drain/air release plug. Design flexible loops so that no thrust loads are imparted to system support anchors or building structure.
- D. Install in a neutral, pre-compressed or pre-extended condition as required for the application. For steam service, install loops with flexible legs horizontal to prevent condensate buildup. Install and guide per manufacturer's recommendations.
- E. Select materials of construction and end fitting type to be consistent with pipe material and equipment/ pipe connection fittings. Connectors A.G.A. certified natural gas service. Connectors UL classified in accordance with ANSI/NSF 61-1977 standards for potable water service.
- F. Approved Manufacturer: The Metraflex Company, Chicago, IL.



## 2.07 ESCUTCHEONS

- A. Provide escutcheons with spring-catch fasteners at all locations where insulated or uninsulated piping, installed exposed to view, penetrates wall, partitions, floors, and ceilings.
- B. Plain pattern, chrome-plated brass for all piping except galvanized steel.
- C. Galvanized around galvanized steel pipe.
- D. Deep recess to cover sleeves at floor penetrations.

## 2.08 FLEXIBLE STAINLESS STEEL HOSE

- A. Stainless steel braid and carbon steel fittings.
- B. End connections: Sizes 2 ½ "and smaller, threaded male nipples. Sizes 3" and larger, flanged.
- C. Minimum lengths as tabulated below:

| SIZE (INCHES) | MINIMUM SIZE (INCHES) | SIZE (INCHES) | MINIMUM LENGTH (INCHES) |
|---------------|-----------------------|---------------|-------------------------|
| 1/2           | 9                     | 4             | 15                      |
| 3/4           | 10                    | 6             | 20                      |
| 1             | 11                    | 8             | 22                      |
| 1 1/4         | 12                    | 10            | 26                      |
| 1 1/2         | 13                    | 12            | 28                      |
| 2             | 14                    | 14            | 30                      |
| 2 1/2         | 18                    | 16            | 32                      |
| 3             | 14                    |               |                         |

- D. Approved Manufacturer: Type BSS as manufactured by Mason Industries, Inc.

## 2.09 DOUBLE CHECK VALVE ASSEMBLY

- A. Conform to AWWA C510-92.
- B. Include a tightly closing resilient-seated shut-off valve at each end of the body. Fit with four (4) resilient-seated test cocks.
- C. Two (2) independent and internally loaded check valves with replaceable seats
- D. Internal parts easily accessible from the top of the device without removing the check valve body from the line. Install the device in horizontal position.
- E. Rated to 175 psi working pressure and to withstand water temperatures from 32 deg F to 140 deg F.
- F. Valve body bronze with stainless steel springs and threaded ends.
- G. Strainer: Body and cover ASTM B-63 bronze. Screen ASTM A478, Type 304 stainless steel standard 20 mesh. Include body, screen, cap, gasket and self-cleaning blow-off plug with NPT threads.

H. Approved Manufacturer: Febco Model 850

## 2.10 DIELECTRIC CONNECTIONS

A. Approved Manufacturer: Watts Regulator Series 3000 Dielectric Unions and Flange Systems

## 2.11 SAFETY AND RELIEF VALVES

- A. General Requirements: Valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Power Boilers, Unfired Pressure Vessels, etc., shall be tested, rated and listed by National Board of Boiler and Pressure Vessel Inspections and shall bear symbol of ASME and NBB and PVI, unless otherwise specified. Liquid relief valves do not require ASME tagging or marking, or NBB and PVI Certification. Valves for applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:
1. Valves for hot water heating boilers shall conform to the requirements of the ASME Code and have a maximum pressure setting of 30 psig. Valves shall be of Safety Relief type, i.e., shall lift slowly to relieve normal thermal pressure build-up and "pop" to relieve excessive pressure due to "runaway" conditions, caused by the failure of any pressure control device and shut-down firing mechanism on excessive pressure indication. Valve bodies shall be bronze or cast iron, with non-vulcanizing synthetic discs and with seats of bronze.
  2. Valves for direct fired domestic hot water boilers shall conform to requirements of ASME Code, Section IV, Paragraph HG 400.2 (a). Valves shall be of temperature-pressure type, rated at 125 psig test pressure. Thermostatic element shall, on rising temperature, cause the valve to open at 188 degrees F. and valve shall deliver its rated capacity at 208 degrees F. and close drip tight at 183 degrees F. Valves for use on gas fired heaters shall be AGA approved and shall be so stamped or marked.
  3. Valves for combination domestic hot water heater and storage tanks shall conform to the requirements of ASME Code, Section IV and USA Standard Z21.22 and shall be NBB listed. Valves shall be of the temperature - pressure type. Thermostatic element shall, on rising temperature, cause the valve to open at 200 degrees F. and valve shall deliver its rated capacity at 210 degrees F. and close drip tight at 195 degrees F. Valves shall be sized in accordance with Unfired Vessel Code.
  4. Valves for Unfired Pressure Vessels: Safety and safety relief valves on secondary side of unfired pressure tanks, water heaters and heat exchangers shall comply with Code requirements governing applicable equipment as outlined in ASME Code, Section IV, Article 4, Paragraph HG 400.3 and as follows: Secondary side of heat exchanger shall be protected by officially rated valves, set for same pressure or temperature as heretofore specified, when secondary side furnishes steam or hot water for purpose equivalent to purposes for which a boiler would be installed; valves for this purpose shall be sized in accordance with Unfired Vessel Code.
  5. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4 inch to 3 inches IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over 3 inches IPS must be furnished with 125 lb. or 250 lb. flanged inlet and may be equipped with female threaded or 125 lb. flanged outlet.

## PART 3 - EXECUTION

### 3.01 GENERAL INSTALLATION

A. Install work in accordance with manufacturer's instructions and as shown on the Drawings.

- B. Furnish and connect to all valves, brass tags, polished or lacquered, with stamp lettering or numbers filled in with black paint. Identify each zone.
- C. See "Pipe, Valve and Fitting" Specification for more information.
- D. Secure escutcheons to the pipe or insulation and flush with the building surface.
- E. Clean the valves and place them in final operating position

### 3.02 STRAINER INSTALLATION

- A. Installed strainers so they are readily accessible
- B. Remove start-up strainer screen from suction diffusers and strainers and install permanent screens prior to balancing water systems.

### 3.03 FLEXIBLE CONNECTOR INSTALLATION

- A. Install flexible Connectors at all locations where piping connects to cooling towers, chillers, air handlers, pumps, or compressors and other places shown on the Drawings.
- B. Install Flexible Rubber Connectors only in equipment rooms. Where flexible connectors are required in ceilings or other construction away from equipment rooms and when temperatures exceed 250 degrees F, install Flexible Stainless Steel Hoses.
- C. Where Flexible Rubber Connectors can not be installed due to temperature and pressure limitations install Flexible Stainless Steel Hoses.
- D. Install connectors the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.
- E. Install expansion joints in piping gaps equal to the length of the expansion joints under pressure.

### 3.04 RELIEF VALVE INSTALLATION

- A. Furnish and connect to all relief valves, etc., brass tags with stamp lettering or numbers filled in with black paint indicating the working pressure or set pressure.
- B. If, in the opinion of the Architect/Engineer, relief valves, vents and drains have been installed so as to create a hazardous and unsafe condition, make corrections as directed without additional charge.

### 3.05 IR VENT INSTALLATION

- A. Provide automatic air vents with 1/4 inch copper drip lines to the nearest floor or roof drain.
- B. Install air vents where shown on the Drawings and at the high points of all systems and at other locations as required to allow complete venting of air from the system.

### 3.06 DIELECTRIC CONNECTIONS

- A. Isolate connections between dissimilar metallic materials. Use dielectric unions or flanges that provide a complete isolation of the two ends, including bolts for flanges, using materials suitable for the design pressure, temperature and fluid contained.

**END OF SECTION 232007**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Provide variable speed pump control systems as specified herein, as shown of the Drawings and as needed for a complete and proper installation.

## 1.02 SUBMITTALS

- A. Product Data
  - 1. Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.
- B. Shop Drawings
  - 1. Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loading, required clearances and methods of assembly of components.
- C. Wiring Diagrams
  - 1. Submit manufacturer's electrical requirements for power supply wiring to HVAC pumps. Submit manufacturer's wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data
  - 1. Submit maintenance data and parts lists for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.
- E. Warranty
  - 1. Submit warranty for each pump with complete description of the warranty procedures.

## 1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
- B. Firms regularly engaged in manufacture of centrifugal pumps with characteristics, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- C. Codes and Standards
  - 1. HI Compliance: Design, manufacture and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".
  - 2. UL Compliance: Design, manufacture and install HVAC pumps in accordance with UL 778 "Motor Operated Water Pumps".
  - 3. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA Standards.
- D. Certification, Pump Performance
- E. Supply name plate data on pumps and drives: Each pump shall be provided with the following data : GPM, FT of Head, HP and actual Voltage.

## 1.04 DELIVERY, STORAGE AND HANDLING

- A. Handle HVAC pumps and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged HVAC pumps or components; replace with new.
- B. Store HVAC pumps and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris and physical damage.
- C. Comply with Manufacturer's rigging and installation instructions for unloading HVAC pumps and moving them to final location.

## PART 2 - PRODUCTS

## 2.01 VERTICAL CLOSED COUPLED PUMPS

- A. The pumps shall be single stage end suction rear pull out design. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as called for in the plans/schedules.
- B. Pump casing shall be constructed of ASTM A48 class 30 cast iron. The pump casing/volute shall be rated for 250 psi working pressure for all jobs. The pump flanges shall be matched to suit the working pressure of the piping components on the job, with either ANSI Class 125 flanges or ANSI class 250 flanges. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the discharge connection to allow for the installation of a seal flush line. The pump cover shall be drilled and tapped to accommodate a seal flush line which can be connected to the corresponding tapping on the discharge connection, or to an external source to facilitate cooling and flushing of the seal faces.
- C. All casings shall be flanged. Threaded casings not allowed unless extra unions and fittings are provided with that pump to allow servicing.
- D. The pump shall have a factory installed vent/flush line to insure removal of trapped air from the casing and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.
- E. The impeller shall be ASTM B584-836/875 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.
- F. The pump shall incorporate a dry shaft design to prevent the circulating fluid from contacting the shaft. The pump shaft shall be AISI 1045 carbon steel with field replaceable bronze SAE 660 shaft sleeve. In order to improve serviceability and reduce the cost of ownership the shaft sleeve must be slip on (press on not allowable) and must be easily replaced in the field.
- G. The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250°F. This seal must be capable of being flushed externally via a tapping in the pump cover adjacent to the seal cavity. The entire pump line shall use no more than three different sizes of seals.
- H. The pump shall be close coupled to a NEMA standard JM frame motor.
- I. In order to both simplify and reduce the total cost of ownership, the manufacturer shall standardize on no more than three sizes of mechanical seals through out the entire range of the family of pumps. The manufacturer shall not use multiple part numbers for the same part.

## J. Approved Manufacturers:

1. Taco
2. Bell & Gosset
3. Armstrong
4. Approved Equal

## 2.02 PUMP LOGIC CONTROLLER

- A. The controller operation shall operate the system using a tested and proven program that safeguards against undesirable or damaging conditions including:
1. Motor overload
  2. Pump flow surges
  3. Hydraulic cycling (hunting)
  4. End of curve unstable operation: The pump logic controller, through a factory pre-programmed algorithm, shall be capable of protecting the pumps from hydraulic damage due to operation beyond their published end-of-curve. This feature requires a flow meter for activation. The operator interface shall include an owner adjustable flow set point to set the parameters for this routine
- B. The pump logic controller shall be capable of starting, unloading, and stopping pumps based on a system performance program that will minimize energy consumption , provide reliable performance and bumpless transitions.
- C. The integrated logic controller shall be capable of running four different hydronic optimization sub-routines:
1. Setup one: This subroutine shall allow the pump package to track a quadratic system curve and will optimize a secondary distribution loop. It shall use a technology that allows the pump, drive, and motor package to translate the hydronic data from both a pump and system curve and translate it to electrical data. This allows the drive to know exactly where it is in the hydronic world
  2. Setup two: This subroutine shall allow two pumps to run as backup for each other and shall alternate the pumps based on a real time clock.
  3. Setup three: This subroutine shall allow the package to run in a customer defined flow rate. The package will always seek to run at the user defined flow even with fouling causing system changes. It shall use a technology that allows the pump, drive, and motor package to translate the hydronic data from both a pump and system curve and translate it to electrical data. This allows the drive to know exactly where it is in the hydronic world.
  4. Setup four: This subroutine shall incorporate a traditional external sensing and control platform. It shall allow the option of controlling the pumps with three zones of differential pressure or central plant differential temperature. This optional setup shall allow the owner the option of external sensing without adding an external controller. This feature shall be equal to Taco System Logic (TSL) or equal
- D. The control platform shall include a subroutine equal to the Taco Self-Sensing Series with ProBalance™. This subroutine shall allow for the automatic balancing of secondary system distribution pumps. The package shall automatically run system distribution pumps to a user defined duty point and will recognize that duty point and hold the pumps at a speed that matches the actual installed system quadratic system curve. The package will then use this data to set up a new duty point as the max point for the quadratic control curve. Use of external balancing devices or contractors will not be needed.
- E. The package shall serve as a flow metering device and will display pump flow at the user interface.

## 2.03 VARIABLE FREQUENCY DRIVES

- A. The VFD shall convert incoming fixed frequency three-phase ac power into an adjustable frequency and voltage for controlling the speed of three-phase ac motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the driven load and to eliminate the need for motor derating. When properly sized, the VFD shall allow the motor to produce full rated power at rated motor voltage, current, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.
- B. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental (displacement) power factor near unity regardless of speed or load.
- C. The VFD shall have a dual 5% impedance DC link reactor on the positive and negative rails of the dc bus to minimize power line harmonics and protect the VFD from power line transients. The chokes shall be non-saturating. Swinging chokes that do not provide full harmonic filtering throughout the entire load range are not acceptable. VFDs with saturating (non-linear) dc link reactors shall require an additional 3% AC line reactor to provide acceptable harmonic performance at full load, where harmonic performance is most critical.
- D. The VFD's full load output current rating shall meet or exceed nec table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 120% of rated torque for up to 0.5 second while starting.
- E. The VFD shall provide full motor torque at any selected frequency from 20 hz to base speed while providing a variable torque v/hz output at reduced speed. This is to allow driving direct drive fans without high speed derating or low speed excessive magnetization, as would occur if a constant torque v/hz curve was used at reduced speeds. Breakaway current of 160% shall be available.
- F. A programmable automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continuously monitor the motor's speed and load to adjust the applied voltage to maximize energy savings.
- G. The VFD must be able to produce full torque at low speed to operate direct drive fans.
- H. Output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD.
- I. An automatic motor adaptation algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to perform the test.
- J. Galvanic isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog i/o and discrete digital i/o shall include additional isolation modules.
- K. VFD shall minimize the audible motor noise through the used of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD operation while reducing motor noise. VFDs with fixed carrier frequency are not acceptable.



- L. All VFDs shall contain integral emi filters to attenuate radio frequency interference conducted to the ac power line.
- M. The drive enclosure shall be standard as NEMA 12 (ip 55) and optional shall be NEMA 4X (ip 66). See schedules for project requirements.
- N. Protective features:
  - 1. A minimum of class 20 i2t electronic motor overload protection for single motor applications shall be provided. Overload protection shall automatically compensate for changes in motor speed.
  - 2. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature. The VFD shall display all faults in plain language. Codes are not acceptable.
  - 3. Protect VFD from input phase loss. The VFD should be able to protect itself from damage and indicate the phase loss condition. During an input phase loss condition, the VFD shall be able to be programmed to either trip off while displaying an alarm, issue a warning while running at reduced output capacity, or issue a warning while running at full commanded speed. This function is independent of which input power phase is lost.
  - 4. Protect from under voltage. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output, without faulting, with an input voltage as low as 70% of the nominal voltage.
  - 5. Protect from over voltage. The VFD shall continue to operate without faulting with a momentary input voltage as high as 130% of the nominal voltage.
  - 6. The VFD shall incorporate a programmable motor preheat feature to keep the motor warm and prevent condensation build up in the motor when it is stopped in a damp environment by providing the motor stator with a controlled level of current.
  - 7. VFD shall include a "signal loss detection" algorithm with adjustable time delay to sense the loss of an analog input signal. It shall also include a programmable time delay to eliminate nuisance signal loss indications. The functions after detection shall be programmable.
  - 8. VFD shall function normally when the keypad is removed while the VFD is running. No warnings or alarms shall be issued as a result of removing the keypad.
  - 9. VFD shall catch a rotating motor operating forward or reverse up to full speed without VFD fault or component damage.
  - 10. Selectable over-voltage control shall be provided to protect the drive from power regenerated by the motor while maintaining control of the driven load.
  - 11. VFD shall include current sensors on all three output phases to accurately measure motor current, protect the VFD from output short circuits, output ground faults, and act as a motor overload. If an output phase loss is detected, the VFD will trip off and identify which of the output phases is low or lost.
  - 12. If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. It shall also be possible to program the VFD so that it reduces its output current limit value if the VFD's temperature becomes too high.
  - 13. In order to ensure operation during periods of overload, it must be possible to program the VFD to automatically reduce its output current to a programmed value during periods of excessive load. This allows the VFD to continue to run the load without tripping.
  - 14. The VFD shall have temperature controlled cooling fan(s) for quiet operation, minimized losses, and increased fan life. At low loads or low ambient temperatures, the fan(s) may be off even when the VFD is running.
  - 15. The VFD shall store in memory the last 10 alarms. A description of the alarm, and the date and time of the alarm shall be recorded.
  - 16. When used with a pumping system, the VFD shall be able to detect no-flow situations, dry pump conditions, and operation off the end of the pump curve. It shall be programmable to take appropriate protective action when one of the above situations is detected.

## O. Internal Control Algorithm

1. This is a standard HVAC drive that has been upgraded and modified by pump experts for hydronic applications. It is set up with a closed loop internal control sequence that will optimize life cycle, system comfort, and minimize energy consumption.

## P. Interface Features

1. Hand, off and auto keys shall be provided to start and stop the VFD and determine the source of the speed reference. It shall be possible to either disable these keys or password protect them from undesired operation.
2. There shall be an "info" key on the keypad. The info key shall include "on-line" context sensitive assistance for programming and troubleshooting.
3. The VFD shall be programmable to provide a digital output signal to indicate whether the VFD is in hand or auto mode. This is to alert the building automation system whether the VFD is being controlled locally or by the building automation system.
4. Password protected keypad with alphanumeric, graphical, backlit display can be remotely mounted. Two levels of password protection shall be provided to guard against unauthorized parameter changes.
5. All VFDs shall have the same customer interface. The keypad and display shall be identical and interchangeable for all sizes of VFDs.
6. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFD's keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters. Keypad shall provide visual indication of copy status.
7. Display shall be programmable to communicate in multiple languages including english, spanish and french.
8. A red fault light, a yellow warning light and a green power-on light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
9. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD. The VFD shall also have individual fan, pump, and compressor menus specifically designed to facilitate start-up of these applications.
10. A four-feedback PID controller to control the speed of the VFD shall be standard.
  - a. This controller shall accept up to four feedback signals. It shall be programmable to compare the feedback signals to a common setpoint or to individual setpoints and to automatically select either the maximum or the feedback signal as the controlling signal. It shall also be possible to calculate the controlling feedback signal as the average of all feedback signals or the difference between a pair of feedback signals.
  - b. The VFD shall be able to apply individual scaling to each feedback signal.
  - c. For fan flow tracking applications, the VFD shall be able to calculate the square root of any or all individual feedback signals so that a pressure sensor can be used to measure air flow.
  - d. The VFD's PID controller shall be able to actively adjust its setpoint based on flow. This allows the VFD to compensate for a pressure feedback sensor which is located near the output of the pump rather than out in the controlled system.
11. The VFD shall have three additional PID controllers which can be used to control damper and valve positioners in the system and to provide setpoint reset.
12. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.
13. Five simultaneous meter displays shall be available. They shall include at a minimum, frequency, motor current, motor voltage, VFD output power, VFD output energy, VFD temperature in degrees, among others.
14. Programmable sleep mode shall be able to stop the VFD. When its output frequency drops below set "sleep" level for a specified time, when an external contact commands that the VFD go into sleep mode, or when the VFD detects a no-flow situation, the VFD may be

programmed to stop. When the VFD's speed is being controlled by its PID controller, it shall be possible to program a "wake-up" feedback value that will cause the VFD to start. To avoid excessive starting and stopping of the driven equipment, it shall be possible to program a minimum run time before sleep mode can be initiated and a minimum sleep time for the VFD.

15. A run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of initiating an output "run request" signal to indicate to the external equipment that the VFD has received a request to run.
16. VFD shall be programmable to display feedback signals in appropriate units, such as inches of water column (in-wg), pressure per square inch (psi) or temperature (°f).
17. VFD shall be programmable to sense the loss of load and signal this condition via a keypad warning, relay output and/or over the serial communications bus. To ensure against nuisance indications, this feature must be based on motor torque, not current, and must include a proof timer to keep brief periods of no load from falsely triggering this indication.

Q. Standard Control And Monitoring Inputs And Outputs

1. Six dedicated, programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
2. Two terminals shall be programmable to act as either as digital outputs or additional digital inputs.
3. Two programmable relay outputs, Form C 240 V AC, 2 A, shall be provided for remote indication of VFD status.
4. Each relay shall have an adjustable on delay / off delay time.
5. Two programmable analog inputs shall be provided that can be either direct-or-reverse acting.
  - a. Each shall be independently selectable to be used with either an analog voltage or current signal.
  - b. The maximum and minimum range of each shall be able to be independently scalable from 0 to 10 V dc and 0 to 20 mA.
  - c. A programmable low-pass filter for either or both of the analog inputs must be included to compensate for noise.
  - d. The VFD shall provide front panel meter displays programmable to show the value of each analog input signal for system set-up and troubleshooting,
6. One programmable analog current output (0/4 to 20 mA) shall be provided for indication of VFD status. This output shall be programmable to show the reference or feedback signal supplied to the VFD and for VFD output frequency, current and power. It shall be possible to scale the minimum and maximum values of this output.
7. It shall be possible through serial bus communications to read the status of all analog and digital inputs of the VFD.
8. It shall be possible to command all digital and analog output through the serial communication bus.

R. Standard programmable firefighter's override mode allows a digital input to control the VFD and override all other local or remote commands. It shall be possible to program the VFD so that it will ignore most normal VFD safety circuits including motor overload. The VFD shall display firemode whenever in firefighter's override mode. Firemode shall allow selection of forward or reverse operation and the selection of a speed source or preset speed, as required to accommodate local fire codes, standards and conditions.

S. A real-time clock shall be an integral part of the VFD.

1. It shall be possible to use this to display the current date and time on the VFD's display.
2. Ten programmable time periods, with individually selectable ON and OFF functions shall be available. The clock shall also be programmable to control start/stop functions,

- constant speeds, PID parameter setpoints and output relays. It shall be possible to program unique events that occur only during normal work days, others that occur only on non-work days, and others that occur on specific days or dates. The manufacturer shall provide free PC-based software to set up the calendar for this schedule.
3. All VFD faults shall be time stamped to aid troubleshooting.
  4. It shall be possible to program maintenance reminders based on date and time, VFD running hours, or VFD operating hours.
  5. The real-time clock shall be able to time and date stamp all faults recorded in the VFD fault log.
- T. The VFD shall be able to store load profile data to assist in analyzing the system demand and energy consumption over time.
- U. The VFD shall include a sequential logic controller to provide advanced control interface capabilities. This shall include:
1. Comparators for comparing VFD analog values to programmed trigger values
  2. Logic operators to combine up to three logic expressions using Boolean algebra
  3. Delay timers
  4. A 20-step programmable structure
- V. The VFD shall include a cascade controller which allows the VFD to operate in closed loop set point (PID) control mode one motor at a controlled speed and control the operation of 3 additional constant speed motor starters.
- W. Serial communications
1. The VFD shall include a standard eia-485 communications port and capabilities to be connected to the following serial communication protocols at no additional cost and without a need to install any additional hardware or software in the VFD:
    - a. Johnson Controls Metasys N2
    - b. Modbus RTU
    - c. Siemens FLN
    - d. BACnet MS/TP
  2. Optional communication shall include:
    - a. LonWorks Free Topology (FTP)
  3. VFD shall have standard rs-485 port for direct connection of personal computer (pc) to the VFD. The manufacturer shall provide no-charge pc software to allow complete setup and access of the VFD and logs of VFD operation through the rs-485 port. It shall be possible to communicate to the VFD through this USB port without interrupting VFD communications to the building management system.
  4. The VFD shall have provisions for an optional 24 v DC back-up power interface to power the VFD's control card. This is to allow the VFD to continue to communicate to the building automation system even if power to the VFD is lost.
- X. Adjustments
1. The VFD shall have a manually adjustable carrier frequency that can be adjusted in 0.5 khz increments to allow the user to select the desired operating characteristics. The VFD shall also be programmable to automatically reduce its carrier frequency to avoid tripping due to thermal loading.
  2. Four independent setups shall be provided.
  3. Four preset speeds per setup shall be provided for a total of 16.
  4. Each setup shall have two programmable ramp up and ramp down times. Acceleration and deceleration ramp times shall be adjustable over the range from 1 to 3,600 seconds.
  5. Each setup shall be programmable for a unique current limit value. If the output current from the VFD reaches this value, any further attempt to increase the current produced by the VFD will cause the VFD to reduce its output frequency to reduce the load on the VFD.

If desired, it shall be possible to program a timer which will cause the VFD to trip off after a programmed time period.

6. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: external interlock, under-voltage, over-voltage, current limit, over temperature, and VFD overload.
7. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.
8. An automatic "start delay" may be selected from 0 to 120 seconds. During this delay time, the VFD shall be programmable to either apply no voltage to the motor or apply a DC braking current if desired.
9. Four programmable critical frequency lockout ranges to prevent the VFD from operating the load at a speed that causes vibration in the driven equipment shall be provided. Semi-automatic setting of lockout ranges shall simplify the set-up.

Y. Service conditions

1. Ambient temperature, continuous, full speed, full load operation:
  - a. -10 to 45°C (14 to 113°F) through 125 hp @ 460 and 600 volt, through 60 hp @ 208 volt
  - b. -10 to 40°C (14 to 104°F) 150 hp and larger
2. 0 to 95% relative humidity, non-condensing.
3. Elevation to 3,300 feet without derating.
4. AC line voltage variation, -10 to +10% of nominal with full output.
5. No side clearance shall be required for cooling.
6. All power and control wiring shall be done from the bottom.
7. All VFDs shall be plenum rated.

### PART 3 - EXECUTION

#### 3.01 INSPECTION

- A. Examine areas and conditions under which HVAC pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Engineer.

#### 3.02 INSTALLATION

A. General

1. All pumps shall be fitted with a discharge multi-purpose balancing valve or other means of providing system balance, isolation, and check feature for reverse flow. The valve shall be straight or angle pattern and shall be field convertible between the two. The valve shall be ductile iron and rated for 250 psi working pressure for all jobs. The valve flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 psi flanges or ANSI class 250 flanges. The valve shall include the following components; non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation. Valve shall be serviceable under full system pressure. The valve shall be a Taco model MPV Plus Two multi-purpose valve or equivalent.
2. All pump suctions to be fitted with a multifunction inlet suction diffuser fitting equal to that as manufactured by Taco, Inc. The suction guide body and cover plate shall be ductile iron and be rated for 250 psi for all jobs. The guide flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The suction guide shall include the following components; full length S.S. straightening vanes, permanent S.S. strainer, disposable 16 mesh bronze start up strainer, blow down ports, and metering ports. For those pumps where an inlet guide fitting is not installed, there should be five pipe diameters of straight undisturbed flow going

- into the pump suction. The fitting shall be a Taco model SD inlet suction elbow or equivalent.
3. All pumps shall be fitted with one 4 ½" dial pressure gauge piped to the inlet and outlet pump flanges. The gauge is to be isolated from each flange via ¼" ball valve. This gauge is to be used to take the differential across the pump unless otherwise indicated.
  4. Contractor shall install pump in accordance with the manufacturer's instructions. Contractor shall level each pump.
  5. Pipe connections to pumps shall be made in such a manner so as not to exert any stress on pump housings. If necessary to meet this requirement, provide additional pipe supports and flex connectors.
  6. Pumps shall NOT be run dry to check rotation.
  7. Change start-up strainers to permanent strainer upon acceptance of the job. Provide a blowdown valve on each strainer and terminate with hose thread or extend blowdown line to nearest floor drain.
- B. Electrical Wiring
1. Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Contractor.
  2. Provide the control wiring between field-installed controls, indicating devices, and pump control panels and the control wiring specified in HVAC Controls specification.
  3. Interlock wiring between pumps; and between pumps and field-installed control devices which are not factory installed.
- C. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment manufacturer.

### 3.03 TEST AND BALANCE

- A. Refer to the "Balancing System" Section.

### 3.04 ADJUSTING AND CLEANING

- A. Check alignment, and where necessary, realign shafts of motors and pumps within tolerances recommended by the manufacturer and in presence of manufacturer's service representative and the Engineer.
- B. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions and in presence of manufacturer's service representative.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

**END OF SECTION 232123**

## PART 1 - GENERAL

## 1.01 WORK INCLUDED

- A. This Section governs the materials and installation of closed hydronic systems associated with building heating and cooling. The following systems, where applicable, shall be installed as specified herein.

## 1.02 EQUIPMENT SUBSTITUTION

- A. Most items in this DIVISION are eligible for substitution in accordance with the General Conditions and Supplements thereto. Where a proprietary specification is written for a particular item, then only that item may be used. All items eligible for substitution require submission of request for substitution 10 days prior to bid date. This submittal shall include specific models and capacities of equipment and not just manufacturer's literature. Only those manufacturers listed and those receiving written prior approval communicated via addendum shall be considered for review. Verbal approvals will not be given.

## 1.03 TESTING &amp; APPROVING AGENCIES

- A. Where items of equipment are required to be provided with compliance to U.L., A.G.A., or other testing and approving agencies, the contractor may submit a written certification from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the item of equipment has been tested and conforms to the same method of test as the listed agency would conduct.

## 1.04 SUBMITTAL DATA

- A. See Section 01300 for general submittal requirements.
- B. Provide manufacturer's literature for all products specified in this Section, which will be installed under this project.
- C. Provide performance curves for all pumps. Plot the specified operating point for each pump on its respective curve.
- D. Provide complete literature for all components of packaged systems. These include pump performance, heat exchanger calculations, expansion tank capacity, data for all accessories and valves and complete wiring diagrams specific to the exact unit to be supplied. The wiring diagram shall indicate all required field and factory wiring.

## PART 2 - PRODUCTS

## 2.01 IN-LINE WET ROTOR PUMPS.

- A. The pumps shall be single stage, canned-rotor type, in-line design. The capacities and characteristics shall be as called for in the plans / schedules. Pump casing shall be constructed of EN-GJL-250 or ASTM-A 48 Class 35 cast iron. The pump casing / volute shall be rated for 175psi working pressure for all jobs. The pump flanges shall be matched to suit the working pressure of the piping components on the job, with ANSI Class 125 flanges.
- B. All casings shall be flanged connections.
- C. The impeller and shaft shall be Class 304 stainless steel.

- D. The pump and motor form an integral unit without a mechanical seal. The bearings are lubricated by the pumped liquid. No petroleum lubricated bearings will be accepted.
- E. The pumps shall be able to operate as single or parallel variable speed pumps, where the speed is regulated by an integrated variable speed drive. The integrated electronics shall allow these pumps to run in parallel, standby or alternating modes.
  - 1. Parallel pump communication via Ethernet cabling
  - 2. 24 hour run time automatic operation
  - 3. Main/standby operation in the event of failure
  - 4. Simultaneous parallel operation as required by system demand
- F. The commissioning and set up of the pump shall be accessed via:
  - 1. A web interface (data exchange) and use HTML 1.1 web language. The pump shall provide a port for a RJ-45 cable connection.
  - 2. A user interface located on the face of the speed controller
  - 3. The user interface:
    - a. Adjusts modes and mode values
    - b. LED display reads real time mode set values, flow, head, speed and power
    - c. Lockouts unauthorized adjustment of the pump
- G. The electronics shall provide "Auto" as factory default whereas the slope of the proportional curve will automatically match the required system curve, constant pressure control (?p-c), variable differential pressure control (?p-v), and constant curve duty (uncontrolled pump), RPM regulation. RPM (speed) regulation can be accomplished by:
  - 1. Manual (via user interface or HTML)
  - 2. Remote via 0-10Vdc
  - 3. Modbus RTU data protocol
- H. The pump electronics shall come standard with multiple digital inputs and one external digital output to be available for additional mechanical room control and pump status monitoring.
- I. The wiring / electronics enclosure shall be class 2, IP44.
- J. Pumps shall meet UL 778, 1004-1, 508C, CAN/CSA C22.2 #108, #100, #107.1, EMC (89/366 EEC): EN 61000, LVD (73/23/EC): EN 60335-1, EN 60335-2-51, and machine safety (98/37/EC): EN ISO 12100.
- K. The pumps shall be electronically protected, be rated for continuous duty and have a built-in startup circuit. The pump electronics shall provide overcurrent, line surge and current limit protection, thermal monitoring, heat sink status and over temperature protection.
- L. The pump shall be capable of being monitored 24/7 via integrated internet link.
- M. The pump must be driven by an electrically commutated electrical motor (ECM) with permanent magnet rotor. The rotor magnets shall be time stable, non-toxic ceramic magnets (Sr-Fe). The electrically commutated electrical motor shall be driven by a frequency converter with an integrated PFC filter.

## 2.02 APPROVED MANUFACTURERS:

- A. Taco
- B. Bell & Gosset



- C. Armstrong
- D. Approved equal

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. Contractor shall install pump in accordance with the manufacturer's instructions. Pipe connections to pumps shall be made in such a manner so as not to exert any stress on pump housings. Pumps may be suspended direct in the pipes provided the piping can support the pump. If necessary to meet this requirement, provide additional pipe supports and flex connectors.
- B. The pump shaft shall be installed horizontally. The pump may be installed in horizontal or vertical pipes as long as the pump shaft is parallel to the ground.
- C. Arrows on the pump housing indicate the liquid flow direction through the pump. The liquid flow direction can be horizontal or vertical, depending on the pump motor and wiring box (as a group). Motor/wiring box may be turned to various positions and is described in the manufacturer's instructions.
- D. For indoor use only.
- E. Pumps shall NOT be run dry to check rotation.

**END OF SECTION 232123.12**

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of the following Division 23 Sections apply to this section:
  - 1. Section 230010 - General Mechanical Requirements.
  - 2. Section 230529 - Pipe Hangers And Supports
  - 3. Section 230555 - Mechanical System Identification
  - 4. Section 230700 - Pipe Insulation

## 1.02 SUMMARY

- A. This Section includes refrigerant piping used for air conditioning applications. This Section includes:
  - 1. Piping, tubing, fittings, and specialties.
  - 2. Special duty valves.
  - 3. Refrigerants.
- B. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of or separately with packaged air conditioning equipment.

## 1.03 SUBMITTALS

- A. Product data for the following products:
  - 1. Each type of valve specified.
  - 2. Each type of refrigerant piping specialty specified.
- B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximity to equipment.
- C. Brazer's Certificates signed by Contractor certifying that brazers comply with requirements specified under "Quality Assurance" below.
- D. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual specified in Division 01 and Division 23.

## 1.04 QUALITY ASSURANCE

- A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Regulatory Requirements: Comply with provisions of the following codes:
  - 1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping.
  - 2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration.
- C. Mechanical Code of New York State

## 1.05 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of roof piping supports, and roof penetrations.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
- B. Refrigerant Valves and Specialties:
  - 1. Alco Controls Div, Emerson Electric
  - 2. Danfoss Electronics, Inc
  - 3. EATON Corporation, Control Div
  - 4. Henry Valve Company
  - 5. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division
  - 6. Sporlan Valve Company

## 2.02 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.
- B. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.
- C. Copper Tubing: ASTM B 88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

## 2.03 FITTINGS

- A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern for hard drawn and soft copper.

## 2.04 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver)

## 2.05 VALVES

- A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.
- B. Globe: 450 psig maximum operating pressure, 275 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.
- C. Check Valves - Smaller Than 7/8 inch: 500 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.
- D. Check Valves - 7/8 inch and Larger: 450 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Valve shall be straight through or angle pattern, with solder-end connections.

- E. Solenoid Valves: 250 deg. F temperature rating, 400 psig working pressure; forged brass, with Teflon valve seat, two-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2 inch conduit adapter, and 24 volt, 60 Hz. normally closed holding coil.
- F. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.

## 2.06 REFRIGERANT PIPING SPECIALTIES

- A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.
- B. Strainers: 500 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
- C. Moisture/liquid Indicators: 500 psig maximum operation pressure, 200 deg. F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.
- D. Filter-driers: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets. Standard capacity desiccant sieves to provide micronic filtration.
- E. Flanged Unions: 400 psig maximum working pressure, 330 deg. F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8 inch through 1-5/8 inch unions shall be forged steel, and for 2-1/8 inch through 3-1/8 inch shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory-applied rust-resistant coating.
- F. Flexible Connectors: 500 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.

## 2.07 REFRIGERANT

- A. Refrigerant No. 410A, in accordance with ASHRAE Standard 34.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.

### 3.02 PIPE APPLICATIONS

- A. Use Type L, or Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Use Type K, annealed temper copper tubing for 2 inch and smaller without joints, below ground and within slabs. Mechanical fittings (crimp or flair) are not permitted.
- B. Install annealed temper tubing in pipe duct. Vent pipe duct to the outside.

- C. If other than Type ACR tubing is used, clean and protect inside of tubing as specified in Article "CLEANING" below.

### 3.03 PIPING INSTALLATIONS

- A. General: Install refrigerant piping in accordance with ASHRAE Standard 15 - "The Safety Code for Mechanical Refrigeration."
- B. Install piping in as short and direct arrangement as possible to minimize pressure drop.
- C. Install piping for minimum number of joints using as few elbows and other fitting as possible.
- D. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.
- E. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.
- F. Insulate suction lines. Liquid line are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.
- G. Do not install insulation until system testing has been completed and all leaks have been eliminated.
- H. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.
- I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- J. Slope refrigerant piping as follows:
  - 1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
  - 2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
  - 3. Liquid lines may be installed level.
- K. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
- L. Use fittings for all changes in direction and all branch connections.
- M. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- N. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- O. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- P. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

- Q. Locate groups of pipe parallel to each other, spaced to permit applying insulation and servicing of valves.
- R. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inch and larger shall be sheet metal.
- S. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.
- T. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- U. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.
- V. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.
- W. Install moisture/liquid indicators in lines larger than 2-1/8 inch OD, using a bypass line.
- X. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.
- Y. Install flexible connectors at the inlet and discharge connection of compressors.

### 3.04 HANGERS AND SUPPORTS

- A. General: Hanger, supports, and anchors are specified in Division 23 Section "PIPE HANGERS AND SUPPORTS." Conform to the table below for maximum spacing of supports:
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.
- C. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

| NOMINAL PIPE SIZE<br>(Inches) | ROD DIAMETER<br>(Inches) | MAXIMUM SPACING<br>(Feet) |
|-------------------------------|--------------------------|---------------------------|
| 1/2 to 3/4                    | 3/8                      | 5                         |
| 1                             | 3/8                      | 6                         |
| 1-1/4                         | 3/8                      | 6                         |
| 1-1/2                         | 3/8                      | 8                         |
| 2                             | 3/8                      | 8                         |

- D. Support vertical runs at each floor.

### 3.05 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
- B. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.

- C. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.
- D. Fill the pipe and fittings during brazing, with an inert gas (i.e., nitrogen or carbon dioxide) to prevent formation of scale.
- E. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

### 3.06 VALVE INSTALLATIONS

- A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.
- B. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators, and elsewhere as indicated.
- C. Install a full sized, 3-valve bypass around each drier.
- D. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
- E. Electrical wiring for solenoid valves is specified in Division 26. Coordinate electrical requirements and connections.
- F. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
- G. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
- H. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
- I. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
- J. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.
- K. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

### 3.07 EQUIPMENT CONNECTIONS

- A. The Drawings indicate the general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow servicing and maintenance.

### 3.08 FIELD QUALITY CONTROL

- A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.
- B. Repair leaking joints using new materials, and retest for leaks.

### 3.09 CLEANING

- A. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
  - 1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
  - 2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
  - 3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
  - 4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

### 3.10 ADJUSTING AND CLEANING

- A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Clean and inspect refrigerant piping systems in accordance with requirements of Division-23 General Mechanical Requirements
- C. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

### 3.11 COMMISSIONING

- A. Charge system using the following procedure:
  - 1. Install core in filter dryer after leak test but before evacuation.
  - 2. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
  - 3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
  - 4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
  - 5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
  - 6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.
  - 7. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping valves and refrigerant piping specialties.
- B. Review data in Operating and Maintenance Manuals. Refer to Division 01 section "Project Closeout."
- C. Schedule training with Owner with at least 7 days advance notice.

**END OF SECTION 232300**



## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This Section describes the galvanized steel, flexible, and aluminum ductwork for HVAC duct systems in accordance with SMACNA Duct Construction Standards, except as otherwise specified.
- B. The construction material for each ductwork system shall be as listed in the "Ductwork Material Schedule" at the end of this Section.
- C. This Section also describes the fittings, access doors, hangers and supports, manual volume dampers and sealants for each ductwork system as required.

## 1.02 RELATED WORK

- A. Section 230594 - Balancing of Air and Hydronic Systems.

## 1.03 REFERENCES

- A. ASHRAE - Handbook Fundamentals; Latest Edition.
- B. SMACNA - HVAC Duct Construction Standards Metal And Flexible (latest issue)
- C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- D. ASTM B 209 - Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.
- E. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- F. UL 555 S - Fire Dampers & Smoke Dampers.
- G. NFPA 96 - Standard for Commercial Cooking Operations
- H. New York State Mechanical Code.

## 1.04 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and New York State Mechanical Code standards.

## 1.05 SUBMITTALS

- A. Ductwork shop drawings for approval:
  - 1. Coordinate layout duct drawings that differ from ductwork shown on the Drawings.
  - 2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility to maintain or balance the air systems. No dimensional or coordination check of the shop drawings will be made. The Contractor has the sole responsibility to review the Drawings, coordinate ductwork fabrication, and provide clearances and access for installation, maintenance and balancing of this work, and work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the ductwork.
  - 3. Deviations such as changing direction or transforming or dividing ductwork must maintain ductwork cross-sectional area and not exceed transformation taper of 15 degrees.
  - 4. Plans and section showing all equipment and accessories.

5. Minimum 3/8 in. scale, double line, showing sizes, transverse joints, transitions, elevations, clearances and accessories; sections where required.
- B. Shop details and catalog cuts of:
  1. Ductwork construction, including gauge and bracing schedule.
  2. Supports.
  3. Dampers.
  4. Turning vanes.
  5. Fire dampers.
  6. Access doors.
  7. Flexible connections.
  8. Other accessories.

#### 1.06 QUALITY ASSURANCE

- A. Construct all ductwork in accordance with referenced SMACNA Standards, except as otherwise stated. Ductwork pressure classifications shall be in accordance with referenced SMACNA Standards, except as otherwise specified.
- B. For all uninsulated ductwork casings and plenums located outdoors, the reinforcement members shall be galvanized steel or stainless steel.
- C. Construction pressure classification of ductwork are shown on the Drawings. If not shown, the pressure classification shall be greater than or equal to the maximum operating static pressure (minimum 2" w.c. pressure classification).
- D. All ductwork shall be free from pulsation, chatter, vibration and objectionable noise. If any of these defects appear after a system is in operation, correct by removing and replacing, or reinforcing the ductwork, at no additional cost to the Owner.
- E. For all galvanized steel ductwork, zinc coating shall be minimum G90 per ASTM A 653.

### PART 2 - PRODUCTS

#### 2.01 GALVANIZED STEEL RECTANGULAR DUCTS AND FITTINGS

- A. Construct ducts of galvanized sheet steel meeting ASTM A 653 with G90 coating designation, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal And Flexible and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification).
- B. No ducts shall be less than No. 22 U.S. Gauge.
- C. Piping, conduit and structure shall not penetrate ductwork. Where this condition cannot be avoided and with the written permission of the Architect/Engineer, follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transition sections shall slope a maximum of 15 degrees.
- D. Provide 90-degree full-radius elbows with a centerline radius 1.5 times the duct width in the plane of the bend.
- E. For elbows with centerline radius less than 1.5 times the width of the duct in the plane of the bend, provide turning vanes.
- F. Provide square throat elbows with manufactured turning vanes.

- G. All dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets.
- H. For split fittings, the split shall be proportional to the air flow. Construct per SMACNA HVAC Duct Construction Standards- Metal and Flexible.
- I. Transitions and Offsets shall follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transitions shall slope a maximum of 15 degrees.
- J. All branch take-offs perpendicular to the main shall be a 45 degree entry.
- K. Longitudinal seams shall be of the Pittsburgh Lock type outlined in the SMACNA HVAC Duct Construction Standards Metal and Flexible.
- L. Duct transverse joints shall be selected and used consistent with the static pressure class, applicable sealing requirements, materials involved, duct support intervals and other provisions for proper assembly of ductwork outlined in the SMACNA HVAC Duct Construction Standards - Metal and Flexible. Transverse joints T-25a, T-25b (Ductmate) shall only be used. Metal clips will only be allowed (NO PVC). Ductmate shall not be used for the following (use transverse joints T-15 through T-24 in these cases):
  - 1. The Ductmate '45' system shall not be used for applications with duct gauges heavier than 10 or lighter than 22.
  - 2. The Ductmate '35' system shall not be used for applications with duct gauges heavier than 16 GA. or lighter than 26 GA.
  - 3. The Ductmate '25' system shall not be used for application with duct gauges heavier than 20 GA. or lighter than 26 GA.

## 2.02 TURNING VANES

- A. Manufactured with same material as ductwork that it is installed in and to the same pressure classification as ductwork that they are installed in.
- B. Provide turning vanes in all square duct elbows and as noted on the Drawings.
- C. Vanes shall be single thickness Small Vane as detailed in SMACNA HVAC Duct Construction Standards Metal and Flexible.
- D. Where a rectangular duct changes in size at a square-throat elbow fitting, use single thickness turning vanes with trailing edge extensions aligned with the sides of the duct.

## 2.03 ACCESS DOORS

- A. For access doors for use in ductwork receiving Fire Rated Blanket Insulation see Ductwork Insulation Section for requirements. Fabricate all other access doors in accordance with SMACNA Duct Construction Standards Metal And Flexible and as indicated.
- B. For HVAC duct systems, construct doors of the same material as the ductwork. Minimum size of access doors shall be 8 inches by 8 inches, unless shown otherwise.
- C. Provide walkthrough doors where shown. These doors shall have a minimum clear width of 18 inches. Provide doors with 8 inch square double pane wire glass windows. Locate windows not to exceed 5 feet-6 inches to centerline above finished floor of installed casing. Walk-through doors shall be operable from both sides of the door.

- D. Access doors shall be insulated same as duct.
- E. Provide with continuous neoprene gaskets around perimeter of access doors for airtight seal.
- F. Provide all access doors with cam lock latches.
- G. Provide access doors with watertight gaskets in shower room exhaust ductwork. Doors shall be of extra-heavy stainless construction.
- H. All access doors serving a fire damper shall be painted red and shall have a label with white letters not less than ½ inch high reading "FIRE DAMPER". No external ductwork insulation shall conceal a fire damper access door unless there is a label attached to the insulation indicating the exact location of the access door.
- I. Provide access doors in following locations:
  - 1. Heaters and coils in ducts: entering and leaving side.
  - 2. Automatic dampers: linkage side.
  - 3. Fire damper, on both sides of ducts.
  - 4. Smoke detection heads.
  - 5. On both sides of ducts where necessary to provide maintenance accessibility to equipment on either side.
  - 6. VAV boxes
  - 7. Heating and Cooling coils.
  - 8. Fan Plenums.
  - 9. In-Line Fans (suction and discharge sides)
  - 10. Other items requiring access for service/maintenance
- J. Where duct access doors are concealed the Contractor shall furnish and pay for installation of access doors to be mounted in the fire rated walls and ductwork enclosures. The access doors must be fire resistive and minimum 6" larger on each side than the duct access door for the above mentioned applications.

#### 2.04 MANUAL VOLUME DAMPER

- A. Fabricate in accordance with SMACNA Duct Construction Standards Metal And Flexible, and as indicated.
- B. Fabricate single blade dampers for duct sizes up to 6 inches in height.
- C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 4 inches for ducts above 6 inches in height. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches, provide regulator at both ends.
- F. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
- G. Volume damper shall be provided at each duct branch and also where shown on the Drawings. Volume dampers must be installed at each branch even if they are not shown on the Drawing.

- H. Approved Manufacturers:
1. Ruskin Mfr. Co.
  2. Arrow Damper & Louver.
  3. Imperial Damper Co.

#### 2.05 BACKDRAFT DAMPERS

- A. Dampers shall be low-leakage, parallel-blade type. Damper sizes shall be suitable for duct sizes noted on the Drawings. The dampers shall be suitable for a minimum 4000 fpm velocity.
- B. Damper frames shall be minimum No. 12 gauge galvanized steel blades shall be minimum No. 16 gauge galvanized steel or Type 6063-T5 aluminum with press-fit ball bearings.
- C. Dampers shall be complete with adjustable counterweights and linkage for duty at .20 inches w.g. and 3500 fpm.
- D. Provide neoprene or silicone rubber blade seals.
- E. Approved manufacturers - Ruskin Manufacturing Company.

#### 2.06 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

#### 2.07 DUCT HANGERS AND SUPPORTS

- A. Provide trapeze, strap or angle iron hangers meeting SMACNA HVAC Duct Construction Standards Metal and Flexible.
- B. Materials of hangers, supports and fasteners shall conform to the manufacturer's load ratings.
- C. Hangers, supports, upper attachments and inserts shall be hot-dip galvanized steel or stainless steel.
- D. Fasteners for HVAC duct systems shall be hot-dip galvanized steel, cadmium-plated steel or stainless steel.
- E. Secure ductwork hangers attached to concrete structures and slabs with embedded inserts, anchor bolts or concrete fasteners. A safety factor of 5 should be used in selection of all inserts and expansion bolts (if applicable safety factor shall be determined by analysis of seismic loads and the greater safety factor shall be used).
- F. Provide hangers and supports not more than 12 inches from each face of a horizontal elbow.
- G. Plenums shall be supported to permit personnel to enter the plenum. If no structural steel design is shown on the Drawings, it is the responsibility of the Contractor to provide the services of a licensed structural engineer in the in which the project is to be constructed to submit a structural design for review.

## 2.08 SEALANTS

- A. Where ducts are not continuously welded or soldered, provide sealants and gaskets as required to meet the specified duct leakage allowance.
- B. Provide Gaskets, Sealers, Mastics and Tapes as manufactured by Ductmate.

## 2.09 FIRE DAMPERS

- A. Fabricate and install in accordance with NFPA 90A and UL Safety Standard 555, and AMCA Standard 500.
- B. Fire Resistance: For penetrations through construction rated less than 3 hours, 1 ½ hours. For penetrations through construction rated for 3 hours or more, 3 hours.
- C. Pressure Differential Rating: 4 in. w. g.
- D. Velocity Rating: 2000 fpm
- E. Fabricate curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades in air stream. Fabricate fire dampers for vertical and horizontal position.
- F. Fabricate multiple blade fire dampers with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G. Fusible links, UL 33, shall separate at 165 degrees F.
- H. Acceptable Manufacturers:
  - 1. Greenheck Model DFD 150, 200 and 350
  - 2. Ruskin Mfr. Co.
  - 3. Arrow Damper & Louver.
  - 4. Imperial Damper Co.

## 2.10 COMBINATION FIRE SMOKE DAMPERS

- A. Fabricate and install in accordance with NFPA 90A and UL Safety Standards 555 & 555S, and AMCA Standard 500.
- B. Fire Resistance: For penetrations through construction rated less than 3 hours, 1 ½ hours. For penetrations through construction rated for 3 hours or more, 3 hours.
- C. Leakage Class: Leakage Class II per UL 555S
- D. Fusible links, UL 33, shall separate at 165 degrees F.

OR

- E. Resettable links shall be provided in lieu of a fusible link. Resettable link shall interrupt power to the actuator causing the actuator's spring return mechanism to cause the damper to close at 165 degrees F. Resettable link to be provided with an electric sensor (thermostat). Sensor to be of the manual reset type and shall be capable of being reset after the temperature has cooled down below the sensor set point.

- F. Pressure Differential Rating: 4 In. w. g.
- G. Air Flow Velocity: 2000 fpm
- H. Elevated Temperature Rating: 350 Deg. F per UL555S
- I. Fabricate multiple blade fire dampers with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- J. Actuators: 24 VDC, 2-position, external mounting
- K. Acceptable Manufacturers:
  - 1. Greenheck Model FSD-200
  - 2. Ruskin Mfr. Co.
  - 3. Arrow Damper & Louver.
  - 4. Imperial Damper Co.

#### 2.11 KITCHEN EXHAUST DUCTWORK (PRE-FABRICATED)

- A. Furnish single-wall, factory built, grease duct for use with Type I kitchen hoods, which conforms to the requirements of NFPA-96. Products shall be ETL listed to UL-1978 and CAN/ULC-S662 for venting air and grease vapors from commercial cooking operations as described in NFPA-96.
- B. The duct wall shall be constructed of .036 and .047 thick stainless steel and be available in diameters 8" through 24".
- C. All supports, fan adapters, hood connections, fittings and expansion joints required to install grease duct shall be included.
- D. Roof penetrations shall comply with listed clearance to combustibles. The grease duct will terminate at the fan adapter plate, will be fully welded to the fan adapter plate and the fan adapter plate will be fastened to the curb using a suitably sized fastener provided by others. See manufacturers installation instructions for more details.
- E. Grease duct joints shall be held together by means of formed vee clamps and sealed with 3M Fire Barrier 2000+. Screws used to secure the vee clamps shall be of the hex-head type with flanged stops and tapered "lead in" threads for easy starting. Nuts shall be retained by means of a free-floating cage to allow easy alignment.
- F. Grease duct installed outside of the building shall be protected against accidental damage or vandalism.
- G. Support vertically installed grease duct from the building structure using rigid structural supports. Anchor supports to the structure by welding or bolting steel expansion anchors or concrete inserts. Support horizontally installed grease duct from the building structure using above method. 1/2" Threaded rod and saddles may also be used for the support of horizontal grease duct.
- H. Fans shall be supported independently from the grease duct sections. Protect grease duct from twisting or movement caused by fan torque or vibration.
- I. Duct shall slope not less than one-fourth unit vertical in 12 units horizontal toward a grease reservoir. If a grease reservoir is not provided, slope shall be towards the hood.

## 2.12 ALUMINUM DUCTWORK

- A. Construct ducts of minimum No. 20 gauge aluminum sheet meeting ASTM B 209, Series 3000 Alloy.
- B. Construct ductwork as per "GALVANIZED STEEL RECTANGULAR DUCTS AND FITTINGS" section above unless otherwise noted in this section.
- C. At shower room locations, pitch horizontal ductwork minimum ¼ inch per foot such that low point is at shower room.

## 2.13 CLOTHES DRYER EXHAUST DUCTWORK

- A. Construct ducts of rigid metal and shall have a smooth interior finish.
- B. Exhaust system shall be independent of all other systems.
- C. Fire dampers, combination fire/smoke dampers, and any similar device that will obstruct the exhaust flow, shall be prohibited in clothes dryer exhaust ducts.
- D. Each vertical riser shall be provided with a means for cleanout.
- E. Terminations at building exterior shall be provided with a backdraft damper. Screens shall not be installed at the duct termination.
- F. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the exhaust flow. The male end of the duct at overlapped duct joints shall extend in the direction of airflow.
- G. Clothes dryer transition ducts used to connect the appliance to the exhaust duct system shall be limited to single lengths not to exceed 8 feet and shall be listed and labeled for the application. Transition ducts shall not be concealed within construction.
- H. Clothes dryer exhaust ducts shall not be connected to a vent connector, vent, or chimney.
- I. Clothes dryer exhaust ducts shall not extend into or through ducts or plenums.
- J. Install in accordance with the manufacturer's instructions and the Mechanical Code of New York State.

## 2.14 STANDARD FLEXIBLE CONNECTIONS

- A. Provide fabric flexible duct connections.
- B. Fabric shall be UL approved, fire-retardant, closely-woven glass, double coated with neoprene, and a minimum of 4 inches wide.
- C. Shall be installed at duct connections to all ceiling hung fans and where vibration will be transmitted through ductwork.
- D. Approved Manufacturers:
  - 1. "Ventglas" by Vent Fabrics, Inc.

## 2.15 FLEXIBLE DUCTS

- A. Comply with SMACNA HVAC Flexible Duct Construction Standards and NFPA 90A.



- B. Provide where indicated on the Drawings Flexmaster Type TL- M Flexible Metal UL181 Class I Air Duct.
- C. The duct shall be constructed of .005" thick 3003-H14 aluminum alloy in accordance with ASTM B209.
- D. The duct shall be spiral wound into a tube and spiral corrugated to provide strength and flexibility.
- E. The internal working pressure rating shall be at least 10" w.g. positive and 10" w.g. negative with a bursting pressure of at least 2½ time the working pressure.
- F. The duct shall be rated for a velocity of at least 5500 feet per minute.
- G. The duct must be suitable for continuous operation at a temperature range of -40° F to +250° F.
- H. Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 4.2 at a mean temperature of 75° F.
- I. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.
- J. Install flexible metal duct as per SMACNA HVAC Duct Construction Standards Metal and Flexible (Latest Edition).
- K. Flexible ductwork shall only be installed where shown on the Drawings.

#### 2.16 GALVANIZED STEEL ROUND DUCTS AND FITTINGS

- A. Construct ducts of galvanized sheet steel meeting ASTM A 653 with G90 coating designation, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal and Flexible (Latest Edition), and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification). When the ductwork pressure classification of these standards is exceeded, construct galvanized steel round exhaust ductwork in accordance with SMACNA Round Industrial Duct Construction Standards.
- B. For ductwork through 60 inches in diameter, provide ducts of spiral lock-seam construction.
- C. For ductwork over 60 inches in diameter, provide ducts of welded longitudinal seam construction.
- D. For ductwork through 36 inches in diameter, use beaded sleeve transverse joints.
- E. For ductwork over 36 inches in diameter, use gasketed-flanged Van Stone transverse joints. Gasket shall be "440 Gasket Tape" by Ductmate Industries, Inc.
- F. For ductwork under a positive pressure through 96 in. diameter and 10 in. w. g. no reinforcing is required. For ductwork under a negative pressure in exposed areas use duct gauge that will minimize the use of reinforcing as appropriate for the pressures involved.
- G. Draw band joints will not be permitted.
- H. All elbows shall be constructed with a centerline radius equal to 1.5 times the duct diameter.
- I. Provide matching galvanized steel fittings with continuously welded seams and joints.

- J. All take-off connections to duct headers shall be made using tee (90 degrees), lateral (45 degrees), tee cross, lateral cross and "Y" branch fittings of the conical type. All fittings fabricated as separate fittings shall have continuous welds along all seams and joints.
- K. The use of two-piece mitered, vaned elbows will be permitted only with specific written approval from the Architect/Engineer. Provide turning vanes as per SMACNA HVAC Duct Construction Standards Metal and Flexible.

## PART 3 - EXECUTION

### 3.01 INSTALLATION - GENERAL

- A. Install ductwork in accordance with applicable SMACNA Duct Construction Standards Metal And Flexible and approved submittals, and as shown on the Drawings. Duct sizes shown are inside clear dimensions. Where internal duct liners are used, duct sizes shown are inside clear of liner. For ductwork located outside, provide reinforcing sufficient to support wind and snow loads.
- B. The Drawings indicate general locations of ducts. Make additional offsets or changes in direction as required at no additional cost to the Owner.
- C. Wherever ductwork is divided, maintain the cross-sectional area.
- D. Do not exceed 15-degree taper when constructing duct transitions.
- E. Close the open ends of ducts during construction to prevent debris and dirt from entering.
- F. Secure casings and plenums to curbs according to the requirements of the SMACNA HVAC Duct Construction Standards Metal and Flexible.
- G. Make changes in direction with long radius bends.
- H. All unused portions of HVAC supply air and exhaust louvers shall be blanked off with Louver Blank Off Panels, see Ductwork Insulation Section.
- I. All welded and scratched galvanized steel surfaces shall be touched up with zinc-rich paint.
- J. 2 Hr. rated wall penetration: Where small size duct (up to 6 inches x 6 inches) is penetrating a 2 Hr wall the duct shall be constructed of 16 gauge galvanized sheet metal.
- K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- L. Patch and repair all wall penetrations.
- M. Insulation: Where Drawings and Specifications indicate that ducts are to be insulated make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar equivalent in depth to insulation thickness and of suitable size to which insulation may be finished to be mounted on duct.

### 3.02 FITTING INSTALLATION

- A. Use minimum of four sheet metal screws per joint.

- B. Apply approved sealant on duct-to-duct joint before assembly. Apply additional sealant after assembly to make joint airtight.

### 3.03 HANGER AND SUPPORT INSTALLATION

- A. Support ductwork hung from building structure using trapeze, strap or angle iron hangers conforming to SMACNA HVAC Duct Construction Standards Metal and Flexible. Provide supplemental structural steel to span joists where required.
- B. Do not support ductwork from furring, hung ceilings, metal floor deck, metal roof deck or from another duct or pipe.
- C. Do not hang lighting fixtures or piping from ductwork.
- D. Do not use perforated band iron.
- E. Support ductwork at each change in direction.
- F. Where duct connects to or terminates at masonry openings or at floors where concrete curbs are not used, provide a continuous 1 ½ inch by 1 ½ inch by 3/16 inch galvanized steel angle support around the ductwork. Bolt and seal the supports to the building construction using expansion bolts and caulking compound. Seal shall be watertight at floor or wall and duct such that a spill will not pass down through the opening.
- G. Fasten plenums and casings connected to concrete curbs using continuous 1 ½ inch by 1 ½ inch by ¼ inch galvanized steel angle support. Set the angle support in a continuous bead of caulking compound and anchor it to the curb with 3/8 inch diameter anchors on 16 inch centers. Terminate sheet metal at curb and bolt to angle support. Seal sheet metal to curb with a continuous bead of caulking.
- H. For insulated ductwork, install hangers on the outside of the insulation. To maintain the insulation value, inset a piece of 1 inch thick, 6 pcf fiberglass board with a foil/scrim/kraft (FSK) jacket at these supports.

### 3.04 SEALING

- A. Where ductwork is not continuously welded, soldered or gasketed, make seams and joints airtight with sealants.
- B. Install the sealants in accordance with the sealant manufacturer's instructions and recommendations.
- C. Seal all ductwork seams, joints, fastener penetrations and fittings connections with sealants in accordance with SMACNA Seal Classifications as required by SMACNA Duct Pressure Classification. All ductwork, regardless of pressure classification, shall have a minimum Seal Class B.
- D. Completely fill all voids when liquid sealing ductwork. Several applications may be necessary to fill voids caused by shrinkage or runout of sealant.

### 3.05 DUCT-MOUNTED DEVICES AND ACCESS DOORS

- A. Install all dampers, coils, airflow measuring stations, humidifiers and other duct-mounted devices, specified in other sections of the specifications or as shown and provide transformations to dimensions as required. Install devices in accordance with manufacturer's recommendations. Install dampers and coils a minimum of 4 feet away from changes

indirection or transitions. Allow five (5) equivalent diameters of straight ductwork upstream and one (1) equivalent diameter of straight ductwork downstream of airflow measuring devices.

- B. Install access doors in ductwork, plenums and where specified and as shown. Provide access doors for inspection and cleaning automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 18 x 18 inch size for shoulder access and as indicated. Install access doors in the bottom of the ductwork unless they are inaccessible in this location; then install the access doors in either the side or top of the ductwork, whichever is more accessible.
- C. Provide fire damper at locations indicated, and where outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway, duct connections, corrosion resistant springs, bearings, bushings and hinges.
- D. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Engineer.
- E. Provide flexible connections immediately adjacent to equipment in ducts associated with motorized equipment. Cover connections to medium pressure fans with leaded vinyl sheet, held in place with metal straps.
- F. Pilot Ports: Locate pilot ports for measuring airflow in each main supply duct at the downstream end of the straightest run of the main and before the first branch take-off. Form pilot ports by drilling 7/16 inches holes in the duct, lined up perpendicular to airflow on maximum 8-inch centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

### 3.06 CONTROL DAMPER INSTALLATION

- A. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.
- B. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal  $\pm 1/8"$ .
- C. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- D. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- E. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- F. Provide a visible and accessible indication of damper position on the drive shaft end.
- G. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- H. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.
- I. Dampers that are to be installed with air flow measuring stations shall be installed in duct runs with a minimum amount of straight duct upstream and downstream of the damper to allow

accurate flow readings by the air flow measuring station. The Contractor shall verify with the manufacturer the length of straight duct runs required.

### 3.07 SMOKE DAMPER INSTALLATION

- A. Install dampers in accordance with manufacturer's UL Installation Instructions, labeling, and NFPA 90A at locations indicated on the Drawings.
- B. Dampers shall be accessible to allow inspection, adjustment, and replacement of components. Access doors in ductwork, plenums, walls, ceilings, or other general building construction shall be provided. Coordinate with other trades.
- C. Where a damper is installed within a duct, a smoke detector shall be installed in the duct within 5 feet of the damper with no air outlets or inlets between the detector and the damper. The detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
- D. Where a damper is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service shall be installed on either side of the smoke barrier door opening.
- E. Where a damper is installed within an unducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5 feet horizontally of the damper.
- F. Where a damper is installed in a corridor wall or ceiling, the damper shall be permitted to be controlled by a smoke detection system installed in the corridor.
- G. Where a total-coverage smoke detector system is provided within areas served by an HVAC system, dampers shall be permitted to be controlled by the smoke detection system.

### 3.08 DUCTWORK AND EQUIPMENT LEAK TESTING

- A. Leak test each ductwork system within ten working days of ductwork installation and before ductwork is insulated and concealed.
- B. All HVAC ductwork shall be tested. Follow general procedures and use apparatus as outlined in the SMACNA HVAC Air Duct Leakage Test Manual.
- C. Test all ductwork at 100 percent of the pressure classifications indicated.
- D. Air testing during erection shall include separate leakage air tests of air riser, horizontal distribution system, and, after all ductwork is installed and the central stations apparatus is erected, leakage testing of the whole system.
- E. Use Appendix C in the SMACNA HVAC Air Duct Leakage Test Manual to determine allowable leakage rates for each duct section tested.
- F. All devices, including access doors, airflow measuring devices, sound attenuators, damper casings, sensors, test ports, etc. that are furnished and/or installed in duct systems shall be included as part of the duct system leakage allowance. All joints shall be inspected and checked for audible leakage, repaired, if necessary, and retested. Duct leakage shall be limited to the following:

| Average Size of Run<br>Diameter or Equivalent | *A/100 ft. Run |
|-----------------------------------------------|----------------|
| 12 inches or less                             | 10             |

| <b>Average Size of Run<br/>Diameter or Equivalent</b> | <b>*A/100 ft. Run</b> |
|-------------------------------------------------------|-----------------------|
| 20 inches or less                                     | 15                    |
| 30 inches or less                                     | 25                    |
| 40 inches or less                                     | 30                    |
| 50 inches or less                                     | 30                    |
| * (A) = Permissible loss in cfm                       |                       |

- G. Total system leakage shall not exceed 10 percent of the scheduled design capacity of the system when tested as per SMACNA testing methods.

### 3.09 DUCTWORK AND EQUIPMENT LEAK TESTING - GREASE EXHAUST AND WATER LEAK PROOF DUCTWORK

- A. Prior to use, covering or concealment of any ductwork perform a leakage test in the presence of the Owner and Authority Having Jurisdiction.
- B. Perform a light test or other approved test to determine that all welded or brazed joints are liquid tight.
- C. Light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of duct to be tested.
1. The lamp shall be open so as to emit light in all directions.
- D. Repair any visible light leakage.

### 3.10 PAINTING

- A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Ductwork to be painted shall be as shown on the Drawings. Painting shall be in accordance with the requirements of the "Painting" Specification Section.

### 3.11 DUCTWORK MATERIAL SCHEDULE

| <b>AIR SYSTEM</b>                      | <b>DUCTWORK MATERIAL</b>     |
|----------------------------------------|------------------------------|
| Supply, Outside Air & Exhaust Ductwork | Galvanized Steel             |
| Kitchen Exhaust                        | Black Iron / Stainless Steel |
| Shower Room Exhaust                    | Aluminum                     |
| Ductwork Exposed to Weather            | Aluminum                     |
| Clothes Dryer Exhaust                  | Rigid Metal                  |

**END OF SECTION 233113**

## PART 1 GENERAL

## 1.01 SUMMARY

- A. Section Includes
  - 1. The ceiling-mounted circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with standard mounting hardware and variable speed control to provide cooling and destratification.
- B. Summary of Work
  - 1. Installation of the fan, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided by others. Consult the appropriate installation scope of work for information on the available factory installation options, overview of customer and installer responsibilities, and details on installation site requirements.

## 1.02 REFERENCES

- A. National Fire Protection Association (NFPA)
- B. Underwriters Laboratories (UL)
- C. Restriction of Hazardous Substances (RoHS)
- D. International Organization for Standardization (ISO)
- E. National Electrical Manufacturers Association (NEMA)
- F. National Electrical Code (NEC)
- G. Occupational Safety and Health Administration (OSHA)

## 1.03 SUBMITTALS

- A. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods.
- B. Product Data: Specification sheets on the ceiling-mounted fan, specifying electrical and installation requirements, features and benefits, and controller information.
- C. Installation Guide: The manufacturer shall furnish a copy of all operating and maintenance instructions for the fan. All data is subject to change without notice.
- D. Schedule
- E. Ceiling fan sizing, placement, and performance shall be verified using computational fluid dynamics (CFD) analysis. At a minimum, the input data for the CFD analysis shall include the ceiling fan(s), significant obstructions to airflow at the floor level, and the actual space dimensions. As verification of performance, the submittal shall include results of the CFD analysis including, at a minimum, the following performance metrics determined in accordance with ANSI/ASHRAE Standard 55-2017: average air speed, minimum, maximum and average cooling effect from elevated air speed, Predicted Mean Vote, and Predicted Percentage Dissatisfied for seated and standing occupants in each occupied zone.

## 1.04 QUALITY ASSURANCE

- A. Certifications

1. The fan assembly, as a system, shall be Intertek/ETL-certified and built pursuant to the guidelines set forth by UL standard 507.
  2. The fan shall be compliant with NFPA 13-Standard for the Installation of Sprinkler Systems, NFPA 72-National Fire Alarm and Signaling Code, and NFPA 70-2011-National Electrical Code (NEC).
  3. Controllers shall comply with National Electrical Code (NEC) and Underwriters Laboratory (UL) standards and shall be labeled where required by code.
- B. Manufacturer Qualifications
1. The fan and any accessories shall be supplied by Greenheck or approved equal.
  2. ISO 9001-certified
  3. The manufacturer shall not be listed on the Air Movement and Control Association International Inc. (AMCA) Certified Ratings Program (CRP) Non-Licensed Products report in the previous 36 months.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.
- B. The fan and its components must be stored in a safe, dry location until installation.

#### 1.06 WARRANTY

- A. The manufacturer shall replace any products or components defective in material or workmanship for the customer free of charge (including transportation charges within the USA) pursuant to the complete terms and conditions of the Greenheck Warranty in accordance to the following schedule:
- |                 |                                         |
|-----------------|-----------------------------------------|
| 1. Mechanical†  | 15 years                                |
| 2. Electrical†† | 7 years (standard); 15 years (extended) |
| 3. Labor        | 1 year                                  |
- a. "Mechanical" is defined as mechanical components of the fan, including, the gearbox, fan hub, motor frame, mounting, airfoils, and winglets.
  - b. "Electrical" is defined as electrical and electronic components of the fan, including the motor, motor drive, variable frequency drive, and any standard controller or accessories.
  - c. All reasonable costs of repair or replacement will be paid or reimbursed provided customer obtains pre-approval.
  - d. See the complete warranty for more details.
- B. The warranty shall not require the submission of a post installation form or photographs of the installed fan(s) to the manufacturer for the warranty to be in effect.
- C. The warranty shall not require the periodic submission of maintenance records for the warranty to remain in effect.

### PART 2 PRODUCT

#### 2.01 MANUFACTURER

- A. Big Ass Fans
- B. Greenheck
- C. Thermotek



## 2.02 HIGH VOLUME, LOW SPEED FANS

## A. Complete Unit

1. Regulatory Requirements:
  - a. The entire fan assembly (with or without light kit) shall be Intertek/ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507.
  - b. The controller shall be compliant with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) The device may not cause harmful interference, and (2) The device must accept any interference received, including interference that may cause undesirable operation.
2. Sustainability Characteristics:
  - a. The fan shall be designed to move an effective amount of air for cooling and destratification in a variety of applications (including industrial and agricultural) over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
  - b. The controller shall be designed to control fans and lighting systems from a secure, centralized location. The system shall be designed specifically for high volume, low speed fans to ensure maximum control. The system shall include optional smart functionality to maximize energy savings. Smart functionality shall provide the capability to automatically control the speed of the fans using information from user-determined settings and built-in temperature and humidity sensors.
3. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

## B. Onboard Fan Control

1. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be prewired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller with one of the following plugs: NEMA L6-20P Twist-Lock Plug, NEMA L6-30P Twist-Lock Plug, NEMA L15-20P Twist Lock Plug, NEMA L16-20P Twist-Lock Plug.
2. For fans with single-phase input, conversion to three-phase output takes place at the VFD.

## C. Blade System

1. The fan shall be equipped with six (6) airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
2. The fan shall be equipped with six (6) winglets (standard) on the ends of the airfoils.

## D. Motor

1. The fan motor shall be an AC induction type inverter rated at one of the following:
  - a. 1725 RPM, 200-240/400-480 VAC, 50/60 Hz, three-phase
  - b. 1725 RPM, 575-600 VAC, 50/60 Hz, three-phase
2. The motor shall be totally enclosed, fan cooled (TEFC) with an IP44 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in 32 degrees F to 122 degrees F ambient conditions.

## E. Gearbox

1. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X series. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage gearing, a hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range, and shall be lubricated for the life of the product (no oil changes required).
  2. The gearbox shall be equipped with a hollow shaft threaded to accept a ¾" NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.
- F. Mounting Post
1. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.
- G. Mounting System
1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The design of the upper mount shall provide two axes of rotation. This design shall allow for adjustments to be made after the mount is installed to the mounting structure to ensure the fan will hang level from the structure.
  2. The upper mount shall be of ASTM A-36 steel, welded construction, at least 3/16" thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.
  3. All mounting bolts shall be SAE Grade 8 or equivalent.
- H. Hub
1. The fan hub shall be 19" (48 cm) in diameter and shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, eight (8) aluminum spars, and one (1) aluminum spacer fastened with a pin and collar rivet system. The overall design shall provide a flexible assembly such that force loads experienced by the hub assembly shall be distributed over a large area to reduce the fatigue experienced at the attachment point for the fan blade.
  2. The hub shall be secured to the output shaft of the gearbox by means of (10) high strength bolts. The hub shall incorporate five (5) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.
- I. Safety Cables
1. The fan shall be equipped with an upper safety cable that provides an additional means of securing the fan assembly to the building structure. The upper safety cable shall have a diameter of Ø3/8" (1 cm).
  2. The fan shall be equipped with two lower safety cables pre-attached to the fan hub that shall provide an additional means of securing the fan to the extension tube. The lower safety cables shall have a diameter of 1/4" (0.6 cm).
  3. The safety cables shall be fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged Nicopress® sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
  4. Field construction of safety cables is not permitted.
- J. Digital Variable Speed Wall Controller
1. The fan shall be equipped with a digital variable speed wall controller. The controller user interface shall be a wall-mounted, touch interface.
  2. The controller shall be mounted to a standard rectangular or square outlet box.

3. A 150-ft (45.7-m) CAT5 cable shall be provided for connecting the controller to the fan's VFD and to provide power to the controller.
  4. The controller mounting location shall meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
  5. The controller shall have an IP65 rating.
  6. The controller shall provide fan start/stop, speed, and direction control functions.
  7. The controller shall provide diagnostic and fault history information for the connected fan, as well as the ability to configure fan parameters with the assistance of Big Ass Fans Customer Service.
  8. The controller interface shall be able to be secured with a passcode to prevent unauthorized access to fan controls and settings.
  9. The controller shall operate out of the box without setup and upon connection to CAT5 cable.
- K. Fire Control Panel Integration
1. Includes a 10-30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.
- L. Guy Wires
1. Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Fan location shall have a typical bar joist or existing I-beam structure from which to mount the fan. Additional mounting options may be available.
- B. Mounting structure shall be able to support weight and operational torque of fan. Consult structural engineer if necessary.
- C. Fan location shall be free from obstacles such as lights, cables, or other building components.
- D. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.
- E. Each fan requires dedicated branch circuit protection.
- F. Before the controller is installed, the fan system shall be installed by a factory-certified installer according to the instructions in the fan Installation Guide.
- G. Install a rectangular or square outlet box at the controller mounting location.
- H. If the controller will be mounted more than 250 ft (76.2 m) from the fan or if multiple fans will be daisy chained, ensure the optional Accessory Kit is included. The accessory kit shall be installed by a factory- certified installer according to the instructions included with the kit.

#### 3.02 INSTALLATION

- A. The fan and controller shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle irons for bar joist applications. Big Ass Fans recommends consulting a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.

- B. Minimum Distances
  - 1. Airfoils shall be at least 14 ft above the floor.
  - 2. Installation area shall be free of obstructions such as lights, cables, sprinklers, or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.
- C. The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters. Additional details are in the Installation Manual.
- D. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
  - 1. The maximum fan diameter shall be 24 ft (7.3 m).
  - 2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
  - 3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
  - 4. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72 - National Fire Alarm and Signaling Code.
- E. Mount the controller to a flat, readily accessible surface that is free from vibration and away from foreign objects and moving equipment. The controller mounting location must meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
- F. If the smart feature will be used, the controller must not be mounted adjacent to or above a radiant heat source, near HVAC ventilation intakes/exhausts, on a poorly insulated exterior wall, or in a different temperature/humidity environment than the fans it will control. Additional mounting guidelines can be found in the Installation Guide.

**END OF SECTION 233400**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Provide exhaust fans, as specified herein, of sizes and capacities scheduled and in locations shown on drawings.

## 1.02 REFERENCE CODES AND STANDARDS

- A. AMCA 99 - Standards Handbook
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating
- C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans
- D. ASHRAE Handbook, HVAC Applications Volume "Sound and Vibration Control"
- E. UL listed and labeled.

## 1.03 SUBMITTALS

- A. Shop Drawings - Show fan layout, housing, materials, gauges, dimensions, weights and installation details
- B. Product data - Manufacturer's fan performance (data includes cfm, rpm, bhp, motor nameplate data, tip speed, outlet velocity and static pressure) and sound performance (data includes sound power level ratings by octave bands) as tested in accordance with AMCA Standards 210 and 300.
- C. Fan performance curves - Submit curves for all fans with system performance shown, and for plus or minus 10 percent and plus or minus 20 percent change in fan rpm. Curves shall include plotted rpm, horsepower, cfm, static pressure, and fan surge line and operating point.
- D. Certified AMCA Ratings - Submit ratings for air and sound performance.
- E. UL Listing - Submit listing if specified.

## 1.04 QUALITY ASSURANCE

- A. Factory balance each fan statically and dynamically, test run before shipment, and key fan wheel to fan shaft. Fans shall operate quietly and without pulsation or vibration. Conduct sound power level tests for each type fan at the factory in accordance with AMCA 300.
- B. Fans shall operate in the stable range of their performance curves.
- C. The fan external static pressures shown in the schedules are those required by the ductwork and apparatus, and do not include the internal and intake fan losses, inlet vanes or integral outlet dampers, inlet screens, outlet velocity heads or drive losses.
- D. Factory performance test each fan assembled in or as part of apparatus specified to be performance tested. Test shall display scheduled performance characteristics, using certified, calibrated testing instruments provided by the manufacturer of the apparatus.
- E. All fan performance ratings shall be based up on factory tests performed in accordance with AMCA 210. One fan of each type specified shall have actual factory performance tests performed prior to shipment. All fans shall be certified by AMCA and carry its seal.

## PART 2 - PRODUCTS

## 2.01 CENTRIFUGAL DOWNBLAST FANS

- A. Roof mounted exhaust fans shall be of the downblast direct drive type.
- B. The fan housing shall consist of the motor cover, shroud, curb cap and lower windband, and shall be constructed of heavy-gauge aluminum. Housing shall have a rigid internal support structure and leakproof design. The fan shroud shall be one-piece with a rolled bead for extra strength, which directs exhaust air downward. The low windband shall be one piece with formed edges for added strength and the curb cap shall include prepunched mounting holes to ensure correct attachment to the roof.
- C. The fan wheel shall be centrifugal, non overload, backward-inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
- D. Motors shall be permanently lubricated and carefully matched to the fan loads. Motors shall be readily accessible for maintenance. Motors shall be mounted on true vibration isolators, out of the airstream. Each vibration isolator shall be sized to match the weight of each fan.
- E. A NEMA 1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.
- F. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.
- G. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
- H. Approved Manufacturers:
  - 1. Greenheck
  - 2. Cook
  - 3. Ruppaire

## 2.02 DIRECT DRIVEN CENTRIFUGAL IN-LINE EXHAUST FANS

- A. General Description:
  - 1. Base fan performance at standard conditions (density 0.075 Lb/ft<sup>3</sup>)
  - 2. Performance capabilities up to 5,000 cubic feet per minute (cfm) and static pressure to 1.75 inches of water gauge
  - 3. Fans are available in thirteen sizes with nominal wheel diameters ranging from 8 inches through 16 inches (60 - 160 unit sizes)
  - 4. Normal operating temperature up to 130 Fahrenheit (54.4 Celsius)
  - 5. Applications include: intake, exhaust, return, or make-up air systems
  - 6. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number
- B. Wheel:
  - 1. Non-overloading, backward inclined centrifugal wheel
  - 2. Constructed of aluminum
  - 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
  - 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
  - 5. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone.

- C. Motors:
  - 1. AC Induction Motor
    - a. Motor enclosures: Open dripproof
    - b. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
- D. Housing/Cabinet Construction
  - 1. Construction material: Galvanized
  - 2. Square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars
  - 3. Housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction to prevent vibration and to rigidly support the shaft and bearing assembly.
- E. Housing Supports and Drive Frame:
  - 1. Housing supports are constructed of structural steel with formed flanges
  - 2. Drive frame is welded steel which supports the motor
- F. Disconnect Switches:
  - 1. NEMA rated: 1
  - 2. Positive electrical shut-off
  - 3. Wired from fan motor to junction box
- G. Duct Collars:
  - 1. Square design to provide a large discharge area
  - 2. Inlet and discharge collars provide easy duct connection
- H. Access Panel:
  - 1. Two sided access panels, permit easy access to all internal components
  - 2. Located perpendicular to the motor mounting panel
- I. Options/Accessories:
  - 1. Dampers:
    - a. Types: Gravity and motorized (see schedules on Drawing H2.0 for more information)
    - b. Galvanized frames with prepunched mounting holes
    - c. Balanced for minimal resistance to flow
  - 2. Isolation:
    - a. Type: Neoprene/Rubber Mount
    - b. Sized to match the weight of each fan
  - 3. Motor Cover:
    - a. Constructed of galvanized steel
    - b. Covers motor and drives for safety
    - c. Standard on unit specified with UL
- J. Fans shall be Model SQ as manufactured by Greenheck or approved equal.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Install fans, including all necessary structural supports and bracing as scheduled and located on the contract drawings in accordance with manufacturer's instructions and approved submittals.
- B. Connect duct to fans to allow for straight and smooth air flow.

- C. Provide flexible connections (minimum of 4") between fan and duct.
- D. Install fan level: +/- 5 degrees vertical. Final installation shall be free of all leaks from both fan and associated ductwork.

**3.02 START-UP, TESTING, DEMONSTRATION**

- A. Start-up fans after checkout to insure proper alignment and phased electrical connections.
- B. Test fans individually and as part of system.
- C. Insure fans are properly interlocked with supply fans and with control system.
- D. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

**END OF SECTION 233416**



## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This Section describes the outdoor air inlets as specified herein, with capacities, and sizes as scheduled on the Drawings.
- B. Products listed in Part 2 of this Section include:
  - 1. Outdoor Air Louvers

## 1.02 RELATED WORK

- A. Section 061000: Rough Carpentry
- B. Section 076200: Flashing and Sheet Metal
- C. Section 079200: Joint Sealants
- D. Section 230010: General Mechanical Requirements
- E. Section 230594: Balancing of Air Systems

## 1.03 REFERENCES

- A. ASHRAE 70 – Method of Testing for Rating the Airflow Performance of Outlets and Inlets.
- B. NFPA 90A – Installation of Air Conditioning and Ventilation Systems
- C. NFPA 90B – Installation of Warm Air Heating and Air Conditioning Systems
- D. AAMA 2604 – High Performance Organic Coatings on Architectural Extrusions and Panels
- E. AAMA 2605 - High Performance Organic Coatings on Architectural Extrusions and Panels
- F. AMCA 500 - Test Methods for Louvers, Dampers and Shutters
- G. AMCA 511 - Certified Ratings Program for Air Control Devices
- H. Mechanical Code of New York State

## 1.04 SUBMITTALS

- A. Product data – Submit catalog cuts and installation instructions for all products specified, including standard color samples.
- B. Submit published manufacturer's performance data for all of the different types of louvers.
- C. Performance data – For each size and type, submit the following:
  - 1. Free area
  - 2. Maximum airflow in cfm
  - 3. AMCA 511 performance data

## PART 2 - PRODUCTS

## 2.01 OUTSIDE AIR INTAKE / EXHAUST LOUVERS

- A. Aluminum Louvers:
  - 1. Furnish and install louvers of the sizes and capacities as shown on the Drawings.
  - 2. Provide louvers 4 or 6 inches deep (coordinate with architectural drawings) with extruded blades on 37½-degree slope, heavy channel frame, with 3/4-inch expanded, flattened aluminum bird screen.
  - 3. Fabricate from minimum 6063-T5 extruded aluminum.
  - 4. Finish shall be factory finished 70% PVDF. Coordinate with Architectural plans for finish color.
  - 5. Coordinate color with Owner & Architectural drawings or specification. Provide color chips for review by architect/owner.
  - 6. Approved Manufacturers:
    - a. Greenheck
    - b. Ruskin
    - c. Arrow
    - d. Approved equal

## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. Install louvers in locations shown on the Drawings.
- B. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
- C. Install joint sealants as specified in Section 079200.
- D. Coordinate with other work, and provide sheet metal, gaskets, and all other materials and work required to ensure an air-tight seal between intake plenum and outside air intake air opening. Blank-off and seal unused louver openings air tight with galvanized steel sheet metal.

**END OF SECTION 233700**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. This Section describes the air terminals as specified herein, with capacities, distribution patterns and connection sizes as scheduled on the Drawings.
- B. Products listed in Part 2 of this Section include:
  - 1. Grilles and Registers.
  - 2. Ceiling Diffusers.

## 1.02 RELATED WORK

- A. Section 233113: Sheet Metal Work

## 1.03 REFERENCES

- A. ADC 1062 GRD - Test Code for Grilles, Registers and Diffusers
- B. ASHRAE 70 - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.
- C. ASHRAE 113 - Method of Testing Room Air Diffusion
- D. ASTM C423 - Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- E. ARI 880 - Air Terminals
- F. ARI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- G. NFPA 90A - Installation of Air Conditioning and Ventilation Systems
- H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- I. Mechanical Code of New York State

## 1.04 QUALITY ASSURANCE

- A. Air Terminals will not be accepted until acoustical test results have been submitted and approved.

## 1.05 SUBMITTALS

- A. Product data - Submit catalog cuts and installation instructions for all products specified, including standard color samples.
- B. Submit published manufacturer's performance data for all of the different types of diffusers, registers and grilles, based on testing in accordance with ASHRAE Standard 70, latest edition.
- C. Performance data - For each size and type of air terminal , submit the following:
  - 1. Inlet static pressure in inches w.g.
  - 2. Maximum and minimum airflow in cfm.
  - 3. Throw in feet at maximum cfm (and 25 percent of cfm) for terminal velocities of 50 and 100 fpm.

4. Noise Criteria (NC) curve at maximum air terminal cfm rating with blades in full-open and closed positions.

## PART 2 - PRODUCTS

### 2.01 CEILING DIFFUSERS

#### A. Stamped Ceiling Diffusers:

1. Furnish and install stamped ceiling diffusers of the sizes and capacities as shown on the Drawings.
2. Manufacture the diffuser from corrosion-resistant steel or extruded aluminum as indicated on the Drawings.
3. Construct the diffuser with four die-formed concentric cones in all sizes. Construct the inner cone assembly to be removable using a spring clip arrangement that permits quick, easy installation and removal.
4. Provide units with radial opposed blade dampers. Provide the diffuser with a removable plug for screwdriver adjustment of the damper without removing the inner core.
5. Manufacture diffusers with trim to allow for recessed mounting in into ceiling grids or for surface mount in other ceiling types.
6. Manufacturer: Nailor Industries Inc, Model Series RNS or approved equal.
7. Coordinate color with Owner

#### B. Round Ceiling Diffusers:

1. Furnish and install round ceiling diffusers of the sizes and capacities as shown on the Drawings.
2. Manufactured the diffuser from corrosion-resistant steel or extruded aluminum as indicated on the Drawings.
3. Round, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Size diffuser collar to project not more than one inch above ceiling.
4. Provide a radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.
5. Manufacture diffusers with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types.
6. Manufacturer: Nailor Industries Inc. Model Series RNR or approved equal.
7. Coordinate color with Owner.

#### C. Architectural Ceiling Diffusers:

1. Furnish and install architectural ceiling diffusers of the sizes and capacities as shown on the Drawings.
2. Manufacture the diffuser from corrosion-resistant steel or extruded aluminum as indicated on the Drawings.
3. Construct the units of a stamped outer core and with the inner core having a plaque style face. Construct the face with a double skinned inner face panel with a hemmed edge. Manufacture the inner core assembly to be removable using a spring clip arrangement that permits quick, easy installation and removal.
4. Manufacture diffusers with trim to allow for with face panel flush with the ceiling line into ceiling grids or for surface mount in other ceiling types.
5. Provide an opposed blade radial volume damper, with an operating arm to adjust the damper without removing the core. Unit collar height; 1 1/4" in height.
6. Provide an equalizing grid for field installation for each diffuser.
7. Manufacturer: Nailor Industries Inc., Model Series UNI or approved equal.
8. Coordinate color with Owner.

#### D. Architectural High Ceiling Perforated Diffusers:

1. Furnish and install architectural high ceiling perforated diffusers of the sizes and capacities as shown on the Drawings.
  2. Manufacture the diffuser from corrosion-resistant steel.
  3. Construct the units of a stamped one-piece outer cone and a heavy gauge inner face panel with a hemmed edge.
  4. Perforated face shall have 3/8" diameter holes on 5/8" staggered centers.
  5. Provide an opposed blade radial volume damper, with an operating arm to adjust the damper without removing the core. Unit collar height; 1 1/4" in height.
  6. Manufacturer: Nailor Industries Inc., Model Series UNI-PD or approved equal.
  7. Coordinate color with Owner.
- E. Architectural High Ceiling Adjustable Downblast Diffusers:
1. Furnish and install architectural high ceiling perforated diffusers of the sizes and capacities as shown on the Drawings.
  2. Manufacture the diffuser from corrosion-resistant steel.
  3. Construct the units of a stamped one-piece outer cone and a inner core that has a square face plate and includes a round, easily adjustable radial vane in the center.
  4. The radial vane shall have a ring operator that allows for pole operation.
  5. Provide an opposed blade radial volume damper, with an operating arm to adjust the damper without removing the core. Unit collar height; 1 1/4" in height.
  6. Manufacturer: Nailor Industries Inc., Model Series UNI-AD or approved equal.
  7. Coordinate color with Owner.

## 2.02 RETURN GRILLES

- A. Furnish and install return grilles of the type and size as shown on the Drawings. Construct the grilles with 45 degree deflection fixed blades and frames that have reinforced mitered corners.
- B. Provide an opposed blade damper operable from the face of the grille for grilles connected to ductwork.
- C. Manufacture grilles with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types. Provide concealed mounting using concealed mounting straps or concealed screw holes in neck. Countersunk screw holes in the frame face are not acceptable or frame face-mounting screws.
- D. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.
- E. Manufacturer: Nailor Industries Inc, Model Series 6145H-O or approved equal.
- F. Coordinate color with Owner.

## 2.03 HEAVY DUTY STEEL RETURN GRILLES

- A. Furnish and install heavy duty return grilles of the type and size as shown on the Drawings. Construct the grilles with 45 degree deflection fixed 14 gauge steel blades spaced on 1/2" centers and a heavy duty 16 gauge steel welded frame.
- B. Provide an opposed blade damper operable from the face of the grille for grilles connected to ductwork.
- C. Manufacture grilles with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types. Provide concealed mounting using concealed mounting straps or concealed screw holes in neck. Countersunk screw holes in the frame face are not acceptable or frame face-mounting screws.

- D. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.
- E. Manufacturer: Nailor Industries Inc, Model Series 6145H-HD-O or approved equal.
- F. Coordinate color with Owner.

#### 2.04 HEAVY DUTY ALUMINUM RETURN GRILLES

- A. Furnish and install heavy duty return grilles of the type and size as shown on the Drawings. Construct the grilles with 0 degree deflection aluminum blades spaced on  $\frac{1}{2}$ " centers and a heavy duty aluminum welded frame.
- B. Provide an opposed blade damper operable from the face of the grille for grilles connected to ductwork.
- C. Manufacture grilles with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types. Provide concealed mounting using concealed mounting straps or concealed screw holes in neck. Countersunk screw holes in the frame face are not acceptable or frame face-mounting screws.
- D. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.
- E. Nailor Industries Inc, Model Series 51FH-HD-OA or approved equal.
- F. Coordinate color with Owner.

#### 2.05 SUPPLY GRILLES

- A. Furnish and install supply grilles of the type and size as shown on the Drawings. Construct the grilles with a dual set of streamlined shaped, roll-formed, corrosion-resistant blades that are adjustable, and spaced on  $\frac{3}{4}$ " centers and frame with reinforced mitered corners.
- B. Manufacture grilles with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types. Provide concealed mounting using concealed mounting straps or concealed screw holes in neck. Countersunk screw holes in the frame face are not acceptable nor are frame face-mounting screws.
- C. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.
- D. Manufacturer: Nailor Industries Inc., Model Series 61DH-O or approved equal.
- E. Coordinate color with Owner.

#### 2.06 CURVED SPIRAL DUCT GRILLES

- A. Furnish and install curved spiral duct grilles of the type and size as shown on the Drawings. Construct the grilles with a dual set of extruded aluminum blades that are spaced on  $\frac{3}{4}$ " centers. The frame shall be corrosion-resistant steel and rolled to match the specified radius.
- B. Provide each unit with a damper extractor constructed of heavy gauge corrosion-resistant steel and operable from the face of the grille (Nailor Industries Inc. Model DEX).
- C. Manufacturer: Nailor Industries Inc., Model Series 61DVC or approved equal.

## PART 3 - EXECUTION

## 3.01 DIFFUSER, REGISTER AND GRILLE APPLICATION

- A. See the Drawings for types, sizes, materials and installation requirements.

## 3.02 INSTALLATION

- A. Install diffusers, grilles and registers in locations shown on the Drawings.
- B. Consult the Drawings for type of ceiling in which the terminals are to be installed and match air outlet edge trim to the requirements of the ceiling type in which they are installed.
- C. Install equalizing grids flush with take-off collar connection to supply duct with vanes perpendicular to air flow approaching diffuser.
- D. Install in accordance with manufacturer's published recommendations as well as applicable sections of SMACNA manual and as specified above.
- E. Install ceiling mounted grilles and registers with the blade deflection facing away from the line of sight.
- F. Coordinate with other work, including ductwork and ductwork accessories, as necessary to interface installation of air outlets and inlets with other work

**END OF SECTION 233713**

## PART 1 - GENERAL

## 1.01 PROVISIONS

- A. Requirements of the General Mechanical Requirements of Division 23 and General Requirements of Division 1 applies to all work under this Section.
- B. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition.

## 1.02 WORK INCLUDED

- A. Provide the following equipment as specified herein and in locations shown on drawings:
  - 1. Kitchen Hood and its appurtenances.

## 1.03 RELATED WORK

- A. Section 233113: Sheet Metal Work
- B. Section 238216: Coils

## 1.04 REFERENCES

- A. NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations
- B. NFPA 17A - Standard for Wet Chemical Extinguishing Systems
- C. UL - Underwriters Laboratories, Inc. (UL)

## 1.05 QUALITY CONTROL

- A. The Kitchen Hood shall be constructed as UL listed and UL labeled, and shall bear the National Sanitation Foundation seal of Approval. The Kitchen Hood shall be built in accordance with NFPA # 96, and ASHRAE recommendations. The hood manufacturer shall provide on request, the necessary data that confirms compliance with above mentioned code authorities.
- B. The Restaurant Fire Suppression System shall be constructed as UL listed and labeled and shall be constructed in accordance with NFPA # 96 and NFPA #17A.
- C. All wiring and electrical equipment shall comply with NFPA 70, NEC.
- D. The hood shall be ETL-listed to standard UL710, ULC710, and ULC-S646 when installed in accordance with these installation instructions and National Fire Protection Association Standard "NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."
- E. The hood shall be built-in compliance with NSF/ANSI Standard 2.
- F. The hood shall be ETL Listed as:
  - 1. "Exhaust Hood Without Exhaust Damper."
  - 2. ETL Sanitation Listed and built in accordance with NFPA 96.
  - 3. The ETL label shall list temperature rating(s) and minimum CFM/ft rating(s).



## 1.06 WARRANTY

- A. All units shall be provided with the following standard warranty:
  - 1. This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 2-years from date of shipment.
- B. The manufacturer shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 2-year warranty period, upon examination by the manufacturer, such part will be repaired or replaced by manufacturer at no charge. The buyer shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without manufacturer's prior authorization, and all returned equipment shall be shipped by the buyer, freight prepaid to a destination determined by the manufacturer.
- C. Refer to Manufacturer's Operation, Installation, and Maintenance (OIM) Manual for detailed descriptions of what is/is not covered and contact information for warranty claims.

## 1.07 SUBMITTALS

- A. Submit shop drawings and product data to Engineer. Provide manufacturer's data of the Hood design for this project. The data for the Hood shall also contain the data for the fire suppression system. Incomplete documents will be rejected.
- B. The manufacturer shall supply complete computer generated submittal drawings, including hood section view(s) and hood plan view(s). These drawings must be available to the engineer, architect, and owner for their use in construction, operation, and maintenance.

## PART 2 - PRODUCTS

## 2.01 COOKING EQUIPMENT KITCHEN HOOD

- A. Design basis (or provide approved equal to the following):
  - 1. Captive Aire ND-2 Series Type I, wall canopy hood for use over 600°F cooking surface temperature.
  - 2. PSP Accessory
  - 3. Stainless Steel Captrate Solo filter with hook.
- B. The exhaust only canopy hood shall be rated for all types of cooking equipment. The hood shall have the size, shape and performance specified on drawings.
- C. Construction shall be type 430 stainless steel with a #3 or #4 polish where exposed. Individual component construction shall be determined by the manufacturer and ETL. Construction shall be dependent on the structural application to minimize distortion and other defects. All seams, joints and penetrations of the hood enclosure to the lower outermost perimeter that directs and captures grease-laden vapor and exhaust gases shall have a liquid-tight continuous external weld in accordance with NFPA 96 and have stainless steel on exposed surfaces. Hood shall be wall type with a minimum of four connections for hanger rods. Corner hanging angles have a 5/8" x 1-1/2" slot pre-punched at the factory, allowing hanging rods to be used for quick and safe installation.
- D. Hood shall be equipped with a minimum of four connections for hanger rods. Hood lengths greater than 12' will have added hangers.

- E. Ventilator shall be furnished with U.L. classified high efficiency stainless steel baffle filters, supplied in size and quantity as required by ventilator. The filters shall extend the full length of the hood and the filler panels shall not be more than 6" in width. Filters shall be ETL Listed. Particulate capture efficiency: 85% efficient at 9 microns, 76% efficient at 5 microns.
- F. The hood manufacturer shall supply complete computer generated submittal drawings including hood sections view(s) and hood plan view(s). These drawings must be available to the engineer, architect and owner for their use in construction, operation and maintenance.
- G. Exhaust duct collar to be 4" high with 1" flange. Duct sizes, CFM and static pressure requirements shall be as shown on drawings. Static pressure requirements shall be precise and accurate; air velocity and volume information shall be accurate within 1-ft increments along the length of the ventilator.
- H. Lighting shall be recessed round LED fixture and LED light, 3500K Warm output.
- I. The hood shall have:
  - 1. A double wall insulated front. The insulation shall have a flexural modulus of 475 EI, meet UL 181 requirements and be in accordance with NFPA 90A and 90B.
  - 2. An integral front baffle to direct grease laden vapors toward the exhaust filter bank.
  - 3. A built-in wiring chase provided for outlets and electrical controls on the hood face and shall not penetrate the capture area or require an external chaseway.
  - 4. A grease drain system which shall be an enclosed integral part of the hood back and have slopes with an exposed, removable 1/2 grease cup to facilitate cleaning.
  - 5. An exposed, removable grease cup for easy cleaning.
  - 6. Performance enhancing lip
  - 7. Perforated supply plenum which shall provide make-up air discharged below the cooking equipment
  - 8. Perforated diffuser plates
  - 9. Hood Mounted Utility Cabinet which can store listed fire suppression system, listed components, pre-wired electrical controls.
  - 10. Stainless steel vertical end and backsplash panels.
- J. The hood shall be ETL Listed as "Exhaust Hood Without Exhaust Damper", ETL Sanitation Listed and built in accordance with NFPA 96. The hood shall be listed for 600°F cooking surfaces at 200 CFM/ft. The hood shall be ETL Listed as "Exhaust Hood Without Exhaust Damper".
- K. Unexposed surfaces shall be constructed of aluminized steel. Plenum shall be insulated to prevent condensation.
- L. condensation.
- M.
- N. Refer to drawings for additional accessories.

## 2.02 ANSUL R-102 RESTAURANT FIRE SUPPRESSION SYSTEM

- A. The restaurant fire suppression system shall be an automatic fire suppression system using a wet chemical agent for grease related fires.
- B. The system shall be pre-engineered in accordance with UL guidelines.
- C. The system shall be installed and serviced by personnel trained by the manufacturer.

- D. The system shall be capable of protecting cooking appliances by utilizing either dedicated appliance protection and/or overlapping appliance protection.
- E. The system shall consist of a regulated release assembly that includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be provided in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station and pressure switches.
- F. Wet Chemical Agent:
  - 1. The extinguishing agent shall be an aqueous solution of organic salts with a pH range between 7.8 - 8.2, designed for flame knockdown and foam securement of grease related fires.
- G. Agent Tank:
  - 1. The agent tanks shall be installed in a stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. The tank shall include an adaptor/tube assembly containing a burst disc union.
- H. Regulated Release Mechanism:
  - 1. The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to the agent tank(s). It shall contain a factory installed regulator.
  - 2. It shall have automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station.
  - 3. The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for conduit. The cover shall contain an opening for a visual status indicator.
  - 4. The regulated release mechanism shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it shall be compatible with electric gas line or appliance shut-off devices.
- I. Regulated Actuator Assembly:
  - 1. When more than two agent tanks are required, the regulated actuator shall be available to provide expellant gas for additional tanks. It shall be connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. The regulator actuator assembly shall contain a regulated actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts to permit installation of the expellant gas line.
- J. Discharge Nozzles:
  - 1. Each discharge nozzle shall be tested and listed with the R-102 system for the specific application. Nozzle tips shall be stamped with the flow number designation. Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.
- K. Distribution Piping:
  - 1. Shall be Schedule 40 black iron, chrome-plated, or stainless steel pipe conforming to ASTM A120, A53, or A106.
- L. Detectors:
  - 1. Shall be the of the fusible link style designed to separate at a specific temperature.
- M. Cartridges:

1. Shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.
- N. Agent Distribution Hose:
  1. Kitchen appliances manufactured with or resting on casters (wheels/rollers), which have the Fire Suppression System hard piped, shall include a UL Listed agent distribution hose as a component of the suppression system. Hose assembly shall include a restraining cable kit.
- O. Pull Station Assembly:
  1. The Fire Suppression System shall include a remote pull station for manual system actuation. The pull station shall be designed to include a built-in guard for pull handle protection. The pull station shall be red in color.
- P. The Ansul system shall be manufactured by Tyco Fire Suppression & Building Products or approved equal.

#### 2.03 KITCHEN HOOD CENTRIFUGAL UTILITY SET EXHAUST FANS

- A. Utility set exhaust fan shall be suitable for use with a Type I kitchen hood serving cooking equipment that produces grease laden vapors. Fan shall be UL762 Listed for restaurant duty.
- B. Fan shall have a vented motor cover.
- C. Fan housing shall be continuously welded.
- D. Fan shall have a clean out door.
- E. Fan shall have a grease drain.
- F. Provide exhaust fan model BI-CARM by CaptiveAire or approved equal.

#### 2.04 KITCHEN HOOD CONTROLS

- A. EMS Series control system by CaptiveAire.
- B. Controls shall be listed by ETL (UL 508A).
- C. The Energy Management System (EMS) shall be capable of saving energy during idle cooking periods. The EMS shall be designed to automatically reduce exhaust and supply airflow quantities while ensuring hood performance is maintained. The EMS shall use high and low speeds that shall be adjusted by variable frequency drives. A temperature switch in the exhaust duct shall control airflow set points and modulate the fans during cooking operation to maximize energy savings. A 100% airflow override button shall be supplied with an adjustable timer.
- D. The control interface shall include (1) fan switch, (1) hood light switch, (1) 100% airflow override push button and indicator lights. Indicator lights shall include a "power" light, a "fans on" light, and a "100% airflow override" light. The control interface shall be screen printed on stainless steel and be able to be installed on the face of the hood, face of the utility cabinet, or on the face of the control enclosure.
- E. The control enclosure shall be NEMA 1 rated and listed for installation inside of the exhaust hood utility cabinet. The control enclosure may be constructed of stainless steel or painted steel.

- F. Variable frequency drives shall allow full adjustment of high speed and low speed airflows for proper kitchen balance. Drives shall contain motor thermal overload protection and control inputs for up to 7 preset speeds. Acceleration and deceleration times shall be fully adjustable as well as fan speed at each of the 7 different inputs. Drives shall also allow for a minimum and maximum frequency set-point. Drives are capable of controlling up to 5 HP each.
- G. Adjustable temperature switch shall be mounted in the exhaust hood riser. One sensor shall be installed per exhaust fan. The temperature sensor shall be of the digital Resistance Temperature Detector (RTD) type. Temperature probe shall be constructed of Stainless Steel. Temperature switch shall be factory set at 130°F for 600°F cooking applications and 90°F for 400°F cooking applications. The temperature sensor shall be fully modulating and shall adjust on temperature changes. The riser mounted temperature sensor shall constantly monitor the exhaust air temperature and work in conjunction with a panel mounted temperature controller to modulate the system based on the temperature.
- H. The timer shall contain one instantaneous contact and one delayed contact. Time shall be adjustable from .05 seconds to 30 days. Timer is energized with the 100% Airflow Override button. When button is depressed, time starts and fans go to high speed. Upon timeout, fans return to low speed or speed dictated by temperature switch.
- I. The EMS shall be provided with a factory pre-wired panel capable of controlling up to four inverter duty motors. The control panel shall be factory pre-wired to shut down the supply fans in a fire condition.

#### 2.05 ROOF MOUNTED, BELT DRIVE, UPBLAST CENTRIFUGAL EXHAUST FAN

- A. Spun aluminum centrifugal roof exhausters are engineered to discharge grease laden vapors, fumes and other contaminants vertically away from the building.
- B. All models shall be ETL Listed and comply with UL705 (electrical) and UL762 Standards and CSA Std C22.2, No 113. Fan shall bear the AMCA certified ratings seal for sound and air performance.
- C. Housing: The fan windband shall be constructed of heavy gauge aluminum and shall be spun on an automatic lathe to provide consistent dimensions. Horizontal and vertical internal supports shall be used to securely fasten the windband to the discharge apron to provide rigidity for hinging and added strength to reduce shipping damage. The discharge apron shall have a rolled bead for added strength.
- D. Base: The base shall be constructed of galvanized steel for improved rigidity. Base corners shall be welded to provide strength and support for hinging and cleaning and to prevent leakage into the building.
- E. Wheel: The fan wheel shall be centrifugal backward inclined and non-overloading. Wheels shall be balanced in two planes and done in accordance with AMCA standard 204-96, Balance Quality and Vibration Levels for Fans. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise. The wheel blades shall be welded to the wheel inlet cone. In the event that balancing weights are required they shall be riveted to the blades or wheel. The wheel inlet shall overlap the fan base inlet for maximum performance and efficiency. The wheel shall be firmly attached to the motor shaft with two set screws.
- F. Motor and motor Compartment: Motors shall be heavy duty ball bearing type, mounted out of the airstream and furnished at the specified voltage, phase and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and isolated from the fan structure with vibration isolators. The motor compartment shall be cooled by outside air drawn through an extruded aluminum conduit tube. To seal the conduit tube passage and prevent noise silicone

rubber grommets shall isolate the conduit tube from the fan housing. The motor compartment shall be of a two-piece construction with the top cap having quick release clips to provide quick and easy access to the motor compartment.

- G. **Shaft and Bearings:** Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for and individually tested specifically for use in air handling applications.
- H. **Belts and Drives:** Belts shall be oil and heat resistant, non-static type. Drives shall be cast type, precision machined and keyed and secured attached to the fan and motor shafts. Drives shall be sized for a minimum of 150% of the installed motor horsepower. Fan operating speed shall be factory set using adjustable pitch motor pulleys.
- I. **Grease Spout:** A grease spout made of aluminum tubing shall be welded to the fan housing. The weld shall be factory tested to ensure it will not leak.
- J. **Nylon Washers:** To provide a tight seal all fasteners in the fan housing shall be backed with nylon washers.
- K. **Safety Disconnect Switch:** A safety disconnect switch shall be standard on all NCA-FA units with open drip proof motors. Switches shall be installed in a NEMA3R enclosure and mounted to exterior of windband for easy access.
- L. **Provide exhaust fan model NCA-FA by CaptiveAire.**

#### 2.06 INLINE HYDRONIC HEAT MAKE UP AIR UNIT

- A. A Modular Packaged Heating, Cooling and ventilating unit(s), as indicated on the drawings shall be furnished. Hydronic Heating Make-up Air Unit(s) shall bear the ETL label. Orientation shall be horizontal, down or side discharge. Unit(s) shall be factory assembled, tested and shipped as a complete packaged assembly, for outdoor mounting, consisting of the following:
  - 1. Hot water piping
  - 2. Centrifugal blower (forward-curved double width/double inlet)
  - 3. Motor starter with thermal overload protection
  - 4. Motor and drive assembly
  - 5. Fuel burning and safety equipment
  - 6. Temperature control system
  - 7. Pre-piped and charged condenser(s)
- B. **Housing:**
  - 1. Unit housing shall be constructed of 20 gauge G-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked air tight with a silicone caulk. All casing panels shall be attached with sheet metal screws or rivets, which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. Housing construction should be suitable for outdoor installation.
  - 2. Internal ridged board 1" x 1.5" foil face installation shall be installed on roof, walls and base of casing.
- C. **Base:**
  - 1. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner.
- D. **Blower:**

1. Blower(s) shall be forward-curved, centrifugal, Class I or II (depending on application requirements), double width, double inlet, constructed G-90 galvanized steel. Unit shall have a heavy-duty, solid-steel shaft. Wheels shall be balanced in two planes and done in accordance with AMCA standard 204-96, Balance Quality and Vibration Levels for Fans. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise. The wheel blades shall be securely attached to the wheel inlet ring. The wheel shall be firmly attached to the fan shaft with setscrews and keys. The blower assembly shall be isolated from the fan structure with vibration isolators.
  2. Blower capacity shall be as noted on the drawings.
  3. All blowers shall be tested and set at rated speed after being installed in the factory-assembled unit.
- E. Motor and Motor Compartment:
1. Motors shall be heavy-duty ball bearing type and furnished at the specified voltage, phase and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and shall be designed to provide easy adjustment of the belt tension. Blower motor shall be Open Drip Proof.
- F. Shaft and Bearings:
1. Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for, and individually tested, specifically for use in air handling applications.
- G. Belts and Drives:
1. Belts shall be oil and heat resistant, non-static, grip-notch type. Drives shall be cast type, precision machined and keyed, and secured attached to the fan and motor shafts. Fan operating speed shall be factory set using adjustable pitch motor pulleys. All drives shall be a minimum of 2 grooves above 2 HP.
- H. Cooling Equipment:
1. All cooling equipment should conform to local code requirements. All gas manifold components shall be piped and wired at the factory.
  2. Components shall include:
    - a. 14 SEER minimum condenser
    - b. Thermal Expansion Valve
    - c. Filter/Dryer
    - d. Hard Start Kit for Condenser
    - e. Insulated Suction Lines
    - f. Multiple Stages where required
    - g. Pre Charged System
    - h. R-410A Refrigerant
- I. Safety Controls:
1. Safety controls shall include:
    - a. Motor starter with adjustable overloads
    - b. Air-flow safety switch
    - c. Electronic flame-safety relay
    - d. High-temperature limit switch
    - e. Two safety shutoff valves
    - f. Stainless Steel Burner
    - g. Adjustable burner ON/OFF inlet air duct-stat to shut off heat when inlet air is sufficiently warm to maintain space temperature
    - h. Non-Fused Disconnect
    - i. Casing insulation shall be 1" x 1.5" density with a foil face

- J. Accessories shall include, but not be limited to, the following:
1. Inlet Dampers: Manufacturer shall provide and install on unit, when possible, a two-position, motor-operated damper with internal end switch to energize the blower-starter circuit, when damper is 80% open. Blades shall be a maximum of 6" wide 16-gauge G-90 galvanized steel and shall be made to guarantee the absence of noticeable vibration at design air velocities. Damper blades are to be mounted on friction-free synthetic bearings. Damper edges shall have PVC coated polyester fabric mechanically locked into blade edge. Jamb seals used are flexible metal, compression type.
  2. Fresh-Air Inlet Hood/Filter Combination: Shall be constructed of G-90 galvanized steel with bird screen and (2") cleanable filters supported by internal slides mounted in the inlet face of the hood.
  3. Curb: 20" curb shall be constructed of 18-gauge aluminized steel as a completed welded assembly.
  4. Cooling Coil Section: Cooling coil section shall be field bolted directly to discharge of blower section. Coil section to be designed to fit onto common curb with main unit. Base of coil section to be constructed with double pitch stainless steel drain pan for coil, same as main unit. Casing and roof to be 20-gauge G-90 galvanized construction. Inside of section to be fully insulated with foil back insulation. DX or chilled water coil to meet scheduled requirements.
- K. Temperature Control Systems:
1. Discharge Temperature Control: Use for building exhaust-air replacement to maintain a constant discharge temperature of supply air. The burner flame modulates to compensate for outdoor temperatures. The optional manual SUMMER-OFF/WINTER selector switch and exhaust system interlock controls the heater-blower operation. Supplied with optional remote-control panel with temperature selector dial and SUMMER-OFF/WINTER selector.
- L. Wiring and Electrical:
1. Each condenser shall have a separate circuit enabling the supply fan motor to accept signals from a VFD without interfering with condenser operation.
  2. Unit(s) shall be complete with all items such as relays, starters, switches, safety controls, conduit and wire as previously mentioned, and as required for proper operation. All factory-mounted controls shall be factory pre-wired to the unit control panel. A safety disconnect switch shall be standard on all units and shall be sized according to the unit.
- M. Unit(s) shall be operated, tested and set at the factory using job-site conditions for electrical input. All operating and safety controls shall be tested and set at the factory. Adjustable or fixed sheaves shall be set for proper RPM at specified conditions. Gas-pressure regulator shall be set for specified burning rate at specified inlet pressure.
- N. The supplier shall furnish as built wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit(s). Service manuals, showing service and maintenance requirements, shall be provided with each unit.
- O. Modular Packaged Cooling Unit with Hydronic Heat for 100% Outdoor Air applications shall be model DU85HFA by CaptiveAire.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install kitchen hood in locations shown on drawings.
- B. Installation to be in accordance with manufacturer's published recommendations as well as applicable sections of SMACNA manual and as specified above.



- C. Provide all steel structural support screws, bolts, nuts, inserts, and material required for installation of the Hood against the wall and for attaching exhaust and supply ducts to the Hood.
- D. Install complete fire suppression system for each hood.
- E. Provide all interlocks between suppression system, exhaust fans, and make-up air fans. Electrical contractor shall provide all relays between fire suppression system and fire alarm panel.

### 3.02 EXHAUST FANS

- A. Ensure enough clearances are around unit as recommended by the manufacturer and NFPA standard.
- B. Connect duct to fans to allow for straight and smooth airflow.
- C. Provide hard connection to duct work. The fan shall be connected to the ductwork by flanges securely bolted. Do not use flexible connectors. Connections shall be made as per NFPA 96. Use 1500 deg F rated gaskets.

### 3.03 INLINE MAKE UP AIR UNIT

- A. Ensure enough clearances are around unit as recommended by the manufacturer and NFPA standard.
- B. Avoid transitions and turns near the outlet of the fan.

### 3.04 TESTING

- A. Check work for satisfactory installation and performance.
- B. Check duct connections for leakage or condensation. Correct any deficiencies.
- C. Test the performance of kitchen exhaust system. Adjust dampers for proper direction of air flow. Conduct final test of hood and hood fire suppression system in the presence of the Engineer.

**END OF SECTION 233813**

## PART 1 - GENERAL

## 1.01 SCOPE

- A. The provisions of Section , Mechanical General specifications apply to all work in this Section.
- B. This Section includes all specifications relating to the furnishing and installing of Double Wall Positive Pressure Vent Systems.
  - 1. SUBMITTALS
    - a. Submit the following items in accordance with Section :
      - 1) Catalogue cuts / Diagrams / Descriptions
      - 2) Sizing calculations
      - 3) Installation Instructions
      - 4) Installation Drawings
      - 5) Copy of product warranties
- C. CODES AND APPLICABLE STANDARDS
  - 1. All products furnished under this Section shall conform to the requirements of The National Fuel Gas Code, ANSI Z223.1 / NFPA-54 where applicable and shall comply with and be listed to UL 1738, the
  - 2. U.S. Standard for Venting Systems for Gas –Burning Appliances, Category II, III and IV and ULC- S636, the Canadian Standard for Type BH gas vent systems. Components coming in direct contact with products of combustion shall carry the appropriate listing.
- D. WARRANTIES
  - 1. The Manufacturer shall warrant the Positive Pressure Vent System against defects in material and workmanship for a period of 15 years from the date of original installation. Any portion of the vent repaired or replaced under the warranty shall be warranted for the remainder of the original warranty period.

## PART 2 - PRODUCTS

## 2.01 POSITIVE PRESSURE VENT

- A. The vent shall be of double wall, factory built type, designed for use in conjunction with Category I, II, III or IV condensing or non-condensing gas fired appliances or as specified by the heating equipment manufacturer.
- B. Maximum continuous flue gas temperature shall not exceed 480°F (249°C).
- C. Vent shall be listed for a minimum positive pressure rating of 6" W.C. and shall have passed at 35" W.C.
- D. The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All system components shall be Intertek ETL and supplied from the same manufacturer.
- E. The vent shall be constructed with an inner and outer tube, where the annular space between the tubes is 2-inch and filled with glass fiber insulation.
  - 1. The inner tube (flue gas conduit) shall be constructed from AL29-4C® stainless steel. The AL29- 4C stainless steel will have a wall thickness of .015" for 3" through 9" diameter vents, .020" for 10" through 16" and .024" for 18" through 24" diameter vents.
  - 2. The outer tube (jacket) shall be constructed from 441 stainless steel with a minimum wall thickness of .015" for 3" through 9" diameter vents, .020" for 10" through 16" and .024" for 18" through 22" diameter vents.

3. All system components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings require to install the vent system shall be Intertek ETL listed and provided by the vent manufacturer.
4. Vent layout shall be designed and installed in compliance with manufacturer's installation instructions, its listing, and all applicable local/ state codes.

## 2.02 APPROVED MANUFACTURERS

- A. Security Chimneys
- B. Jeremias
- C. Enervex

## PART 3 - EXECUTION

### 3.01 VENT SYSTEM LAYOUT

- A. The vent system shall be routed to maintain minimum clearance to combustibles as specified by the manufacturer.
- B. Vent installation shall conform to the manufacturer's installation instructions, its listing and state / local codes.
- C. The vent system and breechings shall be inspected and cleaned before the final connection to the appliances.
- D. MECHANICAL EQUIPMENT
  1. If dampers or fans are installed in conjunction of the vent system, such equipment shall be supported independently from the vent system. Protect the vent system from twisting or movement due to fan torque or vibration.

**END OF SECTION 235133**

## PART 1 – GENERAL

## 1.01 RELATED DOCUMENTS

- A. ANSI Z21.13 – American National Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers
- B. ASME Section IV – Rules for Construction of Heating Boilers
- C. NFPA 54 – National Fuel Gas Code
- D. NFPA 70 – National Electrical Code
- E. ASME CSD-1 – Controls and Safety Devices for Automatically Fired Boilers
- F. AHRI, BTS-2000

## 1.02 SCOPE

- A. The work to be performed includes all equipment, labor and materials required to furnish and install ultra-high efficiency Riello Array Condensing Hydronic Boilers as described in this specification.

## 1.03 SUMMARY

- A. This section includes gas-fired, water-tube condensing stainless steel boilers for heating hot water.
- B. Related sections include, but are not limited to, the following:
  - 1. Section 23 51 33 "Prefabricated Chimneys"

## 1.04 SUBMITTALS

- A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: For boilers, boiler trim, and accessories. Include dimensions, weights, loadings, required clearances, components, and location and size of each field connection.
- C. Wiring Diagrams: Schematic wiring diagram of boiler control system that shows all Components, interlocks, etc.
- D. Manufacturer's Quality-Control Test Reports: Indicate and interpret test results for compliance with performance requirements before shipping.
- E. Field Quality-Control Test Reports: Indicate and interpret test results for compliance with performance requirements before shipping.
- F. Manufacturer's Operation and Maintenance Manual: Include support details, connection requirements, start up instructions, cleaning procedures and replacement part list, maintenance and repair data, etc.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in owner's name and registered with manufacturer.

## 1.05 COORDINATION

- A. Equipment shall be handled, stored and installed in accordance with the manufacturer's instructions.

## 1.06 QUALITY ASSURANCE

- A. The equipment shall, as a minimum, be in strict compliance with the requirements of this specification, shall perform as specified and shall be the manufacturer's standard commercial product unless specified otherwise. Custom designed products intended to meet these listed specifications are unacceptable.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance: Boilers shall bear ASME "H" stamp.
- D. CSD-1 Compliance: Control devices and control sequences according to requirements of CSD-1.
- E. ETL: Boiler shall be ETL certified.
- F. AHRI: Boiler shall be AHRI listed and certified.
- G. SCAQMD: Boiler shall be SCAQMD certified for relevant jurisdictions.
- H. ASHRAE 90.1: Boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 standard.
- I. The entire boiler system as installed shall conform to the manufacturer's instructions, applicable codes and associated National Board requirements.
- J. Manufacturer's Qualifications: The boiler manufacturer shall regularly engage in the production of welded stainless steel helical coil pressure vessels. The boiler manufacturer shall have a history and experience of producing water tube condensing hydronic boilers, and such water tube condensing boilers have been in satisfactory use and service for not less than twenty-five (25) years. Those companies without twenty-five years of experience in standard production condensing water tube boilers shall not be considered.
- K. Manufacturer's Failure Rate: The boiler manufacturer shall produce its own heat exchangers. Boiler manufacturer shall have a history of producing over 100,000 heat exchangers with a heat exchanger failure rate of no more than 0.01% during the warranty period.
- L. Manufacturer's Long-Term Viability: To ensure the long term viability of the manufacturer (necessary for replacement parts and warranty claims), the manufacturer shall have revenue in excess of US\$500 million annually, and must follow Sarbanes-Oxley accounting practices. Publicly traded or privately held companies shall be considered, but those companies not practicing Sarbanes-Oxley general accounting principles shall not be allowed.
- M. Quality Control: The manufacturer shall follow strict quality control standards. For the selected model boiler, it must be standard practice to live fire test 100% of all units produced. The manufacturer shall also validate test all components from outside vendors prior to utilizing such components in their standard production design.

- N. Buy American Act: Manufacturer shall meet the standards of the Buy American Act and its products shall be accepted for federal government installations.
- O. Environmental Responsibility: The manufacturer shall consider environmental responsibility as one of its fundamental core company policies. Manufacturer shall regard quality of performance, economy, and environmental responsibility as equal objectives. Manufacturer shall strictly adhere to all environmental laws and regulations. All packaging materials used shall be environmentally-friendly and recyclable.

#### 1.07 WARRANTY

- A. The boiler manufacturer shall warrant each boiler, including boiler, trim, boiler control system, and all related components and accessories against defects in workmanship and material for a period of 18 months from date of shipment or 12 months from date of installation, whichever comes first.
- B. The mesh burner head shall be warranted for a period of five (5) years from the date of manufacture when installed, operated, and maintained in accordance with the manufacturer's installation and operation manual.
- C. Heat exchanger shall be warranted for a period of ten (10) years non-prorated from date of manufacture. This 10 year non-prorated warranty includes coverage of damage caused by corrosion, leakage and materials when installed, operated, and maintained in accordance with the manufacturer's installation and operation manual. The heat exchanger shall be warranted against damage from thermal shock for the lifetime of the boiler when installed, operated, and maintained in accordance with the manufacturer's installation and operation manual.
- D. The manufacturer will replace, exchange or credit at their option, FOB factory, any parts per the terms above, provided the equipment has been installed, operated and maintained in accordance with the Installation, Operation & Maintenance Manual.

### PART 2 – PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Riello
- B. Weil-McLain
- C. Laars
- D. The manufacturer must have factory employed service personnel. In addition, the boiler manufacturer must offer a factory service training program, where third-party/local service technicians may become 'factory-certified' trained in the start-up, operation, maintenance and service of the specified boiler model. The manufacturer must offer these training classes on a regular basis, with a minimum of at least six classes scheduled annually.
- E. The manufacturer shall be capable of meeting the performance and design specifications with their standard-production product offering. Custom designed or 'one-off' models shall not be considered.
- F. CONSTRUCTION
  - 1. Furnish and install factory fabricated, assembled and tested stainless steel (AISI 316L or 316Ti) water-tube condensing boiler. Each boiler shall be complete with all components

and accessories necessary for a complete and operable boiler as hereinafter specified. Each boiler shall be assembled with required wiring and piping as a self-contained unit.

2. Design: The boiler shall be a gas floor standing condensing boiler with multiple helical coil stainless steel heat exchangers for redundancy. To ensure redundancy boilers with single heat exchangers shall not be accepted.
3. Each module is fully independent and "stand alone" thus allowing boiler operation even if an adjacent module is turned off. The boiler shall be ETL certified as a condensing boiler. The boiler shall operate with natural gas or propane and have an ETL certified input rating as noted on the drawings, and shall be listed with AHRI and shall have a minimum thermal efficiency rating of 96.1% at rated input. The boiler shall be designed for a minimum of 20:1 turn down with constant CO<sub>2</sub> over the turn down range. Oxygen levels in exhaust shall remain below 5.9 percent throughout entire operating range. To ensure optimum efficiency, boilers operating above 5.9% excess oxygen at any firing rate shall not be allowed. The boiler will use a direct ignition system. The design shall provide quiet burner ignition and operation. The burner shall be pre-mix radial type and fire in a 360 degrees pattern.

## 2.02 CONSTRUCTION

### A. Casing

1. The frame shall be made of extruded aluminum alloy (EN AW-6060) and finished with a baked enamel powder coat (RAL7016). The panels shall be made of 18 and 22 gauge carbon steel and finished with a baked enamel powder coat (RAL9006).
2. The cabinet shall include hinged front door(s) and removable access panels for ease of service & maintenance. All removable panels shall include a keyed locking mechanism to prevent unauthorized access.
3. Panels shall include gasketed seals to reduce any potential air infiltration to/from the cabinet.
4. Cabinet shall include removable feet to reduce overall height during installation process.
5. The boiler shall have fork truck provisions for lifting from the sides or front.

### B. Heat Exchanger

1. The heat exchanger shall be a water tube design. Firetube heat exchangers shall not be accepted.
  - a. The heat exchanger shall be manufactured by the boiler manufacturer and consist of a dual helical coil design. Each helical coil shall consist of a single continuous tube, connected only at the ends. Coils constructed with multiple tubes or multiple connections to a common manifold shall not be accepted.
  - b. The heat exchanger shall have water-backed reservoirs on each end of the helical coils. Such reservoirs shall allow expansion and contraction of the coil with minimal mechanical stress.
  - c. The shape of the tubing shall be such to prevent pooling or collecting of condensation anywhere on the surface of the tubing.
  - d. The water tube shall have a minimum equivalent diameter of 1". To minimize the negative potential effects of internal scaling, heat exchangers with tube sizes less than 1" equivalent diameter shall not be accepted.
  - e. To reduce the possibility of internal scaling, the helical coil shall have a water velocity of at least 1.8 ft/s. Heat exchangers with a water velocity of less than 1 ft/s shall not be accepted.
  - f. The water tube (AISI 316L/316Ti) stainless steel heat exchangers shall be inspected and tested to ASME Section IV requirements and shall bear the ASME section IV seal of approval.
  - g. The heat exchangers shall have welded construction (no gaskets) consisting of two pipes working in parallel. Each coil shall have no more than two welded joints (one at each end). The heat exchanger shall be a fully condensing cylindrical counter-flow water tube design with AISI stainless steel tubes and headers.

- h. The heat exchanger shall consist of 316L or 316Ti stainless steel. 400 Series ferritic stainless steel, such as 439 stainless, shall not be acceptable due to its relatively low pitting resistance equivalent number and relatively low ultimate tensile strength. Due to their unproven/relatively short historical track record in condensing boilers, Duplex Alloy materials are also unacceptable.
- i. Carbon steels (including but not limited to SA-516 Gr.70 & SA-53 Gr.B) shall not be allowed anywhere potential condensing may occur (in both the firing and condensing chambers of the boiler), regardless of whether the potential condensing is a result of normal or abnormal operating conditions.
- j. Boilers using cast iron, cast aluminum or copper finned tube heat exchangers are unacceptable.
- k. The pressure vessel shall be fully insulated with high temperature insulation.
- l. The heating surface of each module shall be a minimum 27 SQ.FT/400,000BTU
- m. Each module shall be fully independent and "stand alone" with maximum working pressure of 80 psig (550 kPa).
- n. For ease of removal and replacement, the gas and water connections for the heat exchanger shall include O-ring compression seals. Threaded connections are unacceptable. The heat exchanger shall include a roller tray to slide the exchanger from the boiler cabinet. The individual modules shall be removable from the boiler while the other modules remain firing. The removal and replacement of such heat exchanger shall not require welding or hoisting equipment.
- o. The boiler shall be capable of operating with a minimum outlet water temperature of 68 °F.
- p. Each heat exchanger shall be accessible for visual inspection and cleaning of all internal fire side surfaces.

C. Combustion Chamber

- 1. The boiler shall have sealed combustion capability with an engineered gas/air chamber that ensures proper mixing for stable combustion at all firing rates.
- 2. The combustion chamber shall be a stainless steel construction and an integral part of the heat exchanger which shall be a cylindrical stainless steel counter-flow design.
- 3. A window view port shall be provided for visual inspection of the boiler combustion during firing.
- 4. The firing chamber shall consist of 316L or 316Ti stainless steel. Carbon steel firing chambers shall not be accepted due to the possibility of condensing in such area in the event of abnormal operating conditions.

D. Gas Train

- 1. Each boiler shall be provided with a factory assembled, piped and wired main gas train.
- 2. The main gas train shall consist a low gas pressure switch (manual reset) and a high gas pressure switch (manual reset) as required by code.
- 3. Each heat exchanger shall have its own zero governing gas valve to include dual safety shut off. Each heat exchanger shall also have its own manual gas shutoff valves; one upstream of the zero governing gas valve and one between the zero governing gas valve and the blower.
- 4. The boiler shall be LPG convertible.
- 5. The boiler shall operate on 4"-14" W.C. gas pressure when operating with natural gas and 8"-13" W.C. gas pressure when operating with propane gas.
- 6. The boiler shall need no component changes to operate at high altitude.
- 7. Each heat exchanger module shall have an air/gas ratio control gas valve. The air/gas ratio gas valve shall sense the pressure across the venturi and supply gas to premix with air. This operation shall provide seamless modulation through the entire range of firing rate.

E. Burner



1. The burner shall be a premix burner with a stainless steel knitted metal fiber construction. Ceramic or non-metallic burners are unacceptable.
  2. The burner shall be fully modulating; multi-staged burners with 'stepped' firing rates shall not be accepted.
  3. The burner shall operate with a 5:1 turn down on each module
  4. Alternate boilers claiming higher turndown for a given BTU input must provide references for at least five (5) installations of similar capacity operating at the claimed turndown for at least (3) complete heating seasons.
  5. The burner shall be direct-ignition and include a single self-grounding electrode designed for both ignition and flame monitoring. Separate ignition and flame rods are not acceptable. The use of glow plugs shall not be accepted in lieu of spark ignition.
  6. Flame monitoring shall be flame rod (rectification) type. The use of thermocouple, thermopile or other temperature based flame monitoring shall not be accepted due to their slow response times. Infra-red or ultraviolet sensors shall not be accepted due to their high replacement costs.
  7. Air/Gas ratio control gas valve shall operate on the principle of negative pressure and modulate to maintain combustion characteristics across the full operating range, which shall provide safe operation even in the case of blocked air intake.
  8. The air-gas ratio control valve shall be self-compensating. It shall automatically compensate for changes in draft, backpressure, or air density resulting from changes in ambient air temperature.
  9. The combustion air/gas mixing blower shall be a fully modulating variable speed design capable of matching the burner turndown.
  10. The exhaust venting shall be made of 316L stainless steel. Polypropylene plastic venting shall not be acceptable inside the boiler cabinet. The seams shall be positively secured to prevent leaks.
- F. Emissions
1. The burner shall not produce more than 0.04% of carbon monoxide (CO) at all firing rates.
  2. The burner shall be certified for Oxides of Nitrogen (NOx) of 9 ppm corrected to 3% oxygen.
  3. The burner shall operate with natural gas or propane at no more than 5.1% excess oxygen at all firing rates.
- G. Burner Control
1. Each heat exchanger module shall include its own individual burner control.
  2. Each burner control shall employ a direct spark igniter with 3 trials for ignition followed by lockout. The ignition control sequence shall include times for pre-purge, pre-ignition, ignition, and post-purge.
  3. Each individual burner control shall monitor the heat exchanger's inlet and outlet water temperatures as well as the flue gas temperature. The controller shall continuously monitor the temperature differential across the heat exchanger and shall automatically shutdown the module in the event the operating parameters fall outside of normal range.
  4. The control shall monitor the flue gas temperature of each individual heat exchanger and shutdown the module if the temperature is excessive.
  5. Each burner control shall include its own individual temperature controller. In the event of loss of communication with the system temperature sensor or other heat exchanger modules, each burner control will continue to operate independently in 'emergency mode' by maintaining its own individual temperature setpoint.
  6. Each burner control will monitor the water flow rate through each individual heat exchanger on a continuous real-time basis. The controller will shutdown the burner/heat exchanger if low flow conditions are detected. The flow monitoring shall be performed by a vortex flow meter which provides a continuous analog signal to the burner control. Mechanical flow switches or pressure switches are not acceptable means for monitoring the water flow rate.

7. Each burner control will have its own on/off switch to isolate the power if servicing is necessary.
8. The burner control shall have plug-type electrical connections for ease of servicing in the event replacement is necessary. The plugs shall be factory attached to the wires (without screw terminal connections) to prevent removal and potential mis-wiring by field service technicians.

#### H. Boiler Controls

1. The boiler shall have a touchscreen display located outside the front door panel and a service screen located inside the front door panel. The service screen shall be password protected to prevent unauthorized access to safety critical parameters.
2. The outer display shall consist of a 7" color touchscreen and shall provide full diagnostics including real time data logging, error history, and current operating status/data. Annunciation shall include a minimum of the last ten error codes. Operation data such as temperature and firing rates shall be annunciated with a graphic trend display.
3. The operator touchscreen and service display are intended for annunciation purposes and shall not be control devices. In the event of a touchscreen failure, the boiler shall continue to operate normally without any disruption.
4. The touchscreen shall display the amount of water flow going through each module.
5. The control shall automatically cascade the internal modules to main temperature control. Cascade sequencing shall be designed to optimize boiler efficiency by maintaining a maximum number of modules on, at minimal firing rates while maintaining overall temperature setpoint. Controller shall also automatically rotate the lead boiler and heat exchanger to evenly distribute 'wear-and-tear' of components.
6. The control shall be capable of lead/lag sequencing up to eight 8 boilers in "Cascade".
7. Operational data and error history from lag boilers may be accessed through a single touchscreen on the lead boiler.
8. The touchscreen shall display any error codes whether automatically reset or manually reset.
9. The controller shall include functions such as frost protection, system de-aeration, Domestic Hot Water (DHW) priority, and touchscreen shall annunciate when such functions are activated.
10. The boiler shall be provided as a standard with ModBus RS485 communication capabilities. The RS485 ModBus communication shall be capable of annunciating status and operating data from all boilers through the touchscreen or Building Automation System.
11. Optional protocol converter for ModBus Lonworks, N2, BacNet MS/TP or BacNet IP shall be available as an optional accessory.
12. The boiler control system shall be capable of accepting 0-10VDC remote external analog signal to control the temperature set point.
13. The control system shall be capable of resetting the set point based on outdoor air temperature with the optional outside air temperature sensor (included for field installation). Graphic display of the reset curve shall be available through the operator touchscreen.
14. The boiler safety control shall be furnished with common interlock controls for low gas pressure, high gas pressure, water pressure and secondary low water cut off.
15. Each heat exchanger module within the boiler shall be furnished with the following safety control devices: blocked flue, blocked condensate, water temperature high limit, exhaust stack temperature limit, water flow meter and primary low water cutoff. If any of these safety interlocks detect an abnormal condition, they will shutdown the individual burner/heat exchanger module while allowing the other heat exchanger modules to operate without disruption.
16. The control shall graphically show the firing rate of each module in the boiler and each boiler in the cascade.
17. The firmware of the boiler touchscreen shall have the capability to be upgraded via USB stick.

18. The boiler shall display service reminder notifications.

I. Boiler Trim

1. The boiler shall be equipped with an ASME certified pressure relief valve on each heat exchanger. The relief valve drains shall be manifolded internally within the boiler cabinet to a single outlet connection.
2. Each heat exchanger module shall be equipped with a dedicated water pump, flow meter, pressure and temperature gauge, condensate trap and drain valve.
3. Boiler shall include a system temperature sensor with thermowell
4. Boiler shall include an outdoor temperature sensor.

J. Venting

1. The boiler shall be designed for vertical or horizontal category IV venting, up to 100 equivalent feet of combined air intake and exhaust length.
2. Air may be taken from the room or ducted directly to the boiler using up to up to 100 equivalent feet of combined air intake and exhaust length. Boiler exhaust will be positive pressure type, and ductwork of exhaust venting must be sealed to prevent flue gases from entering boiler room.
3. The following category IV vent materials shall be utilized:
  - a. AL29-4C Stainless for all system applications
  - b. PP, polypropylene for all system applications
  - c. CPVC
  - d. The following guideline shall be used to determine the suitability of vent material:

| Vent Material               | Maximum Flue Temperature (°F)         |
|-----------------------------|---------------------------------------|
| <b>CPVC</b>                 | 194                                   |
| <b>Polypropylene</b>        | 230                                   |
| <b>AL29-4C</b>              | 300+, limited only by rating of seals |
| <b>316L Stainless Steel</b> | 300+, limited only by rating of seals |

4. The boiler shall be equipped with factory installed flue exhaust damper on each module, which allows common venting of Array boilers in cascade.
5. The venting shall be supported by mechanical means other than the boiler. The boiler connections shall not be used to support any structural load from the vent or air intake ductwork.
6. The vent may be horizontal or vertical, with such incline or other means to drain any condensation.

### PART 3 – EXECUTION

#### 3.01 INSTALLATIONS

- A. Installation shall be performed by the contractor in accordance with the requirements of the applicable codes and manufacturer's instructions. Contractor shall review the boiler and installation for compliance with requirements and/or issues that may affect boiler performance. Installation should not proceed until unsatisfactory conditions have been corrected.
- B. Equipment Mounting:
  1. Install boilers level on concrete base. Concrete base is specified in Division 23 Section "Common Work Results for HVAC", and concrete materials and installation requirements are specified in Division 03.

2. The boiler must be installed on a level housekeeping pad at least 3" above the floor for proper condensate drainage and boiler operation.
  3. Comply with requirements of vibration isolation devices.
- C. Install gas-fired boilers according to NFPA 54 and ANSI Z223.1
- D. Assemble and install boiler trim.
- E. Install electrical devices furnished with boiler but not specified to be factory mounted.
- F. Install control wiring to field-mounted electrical devices.
- G. Provide and complete gas and water piping installation as required by manufacturer for operation of system.
- H. Provide and install air intake and exhaust piping, size and type as recommended by the manufacturer.

### 3.02 CONNECTIONS

- A. Piping
1. Each boiler shall be provided with all necessary inlet and outlet connections. Refer to specific Boiler's specification sheet for connection sizes. Piping installation requirements are specified in other Division 23 Sections such as Section 23 20 00 "HVAC Piping and Pumps". Drawings indicate general arrangement of piping, fittings, and specialties.
  2. Check manufacturer's installation manual for clearance dimensions and install piping adjacent to boiler to allow service and maintenance.
  3. Provide and Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection and adhere to proper codes for neutralization. Provide an isolation valve if required. Relief valve drain shall be a minimum of 2.5" NPT size.
  4. Condensate drain shall be a minimum of 1" size. Installer shall supply a means to neutralize the condensate water prior to draining it into the building's drainage piping.
  5. Connect piping to boilers, except safety relief valve connections, with flexible connectors of material suitable for service. Flexible connectors and their installation are specified in Division 23 Section "Common Work results for HVAC".
  6. The gas and water connections shall not be designed to support any external structural load from the piping system.
- B. Venting
1. Install air intake and exhaust venting system per manufacturer's recommendations and state/provincial codes.
  2. Components shall comply with requirements in Section 23 51 33 "Prefabricated Chimneys".
- C. Electrical Requirements
1. Voltage shall be 120 VAC, 1-phase, 60 Hz (Phase - Neutral).
  2. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems".
  3. Connect wiring according to Division 26 Section "Low Voltage Electrical Power Conductors and Cables".

### 3.03 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel as specified below:

1. Operate boiler, including accessories and controls, to demonstrate compliance with requirements.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout" AND "Operation and Maintenance Data".
4. Schedule training with Owner with at least 7 days advance notice.

**END OF SECTION 235216**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. A. Dual channel, self-contained gas detection system with integral carbon monoxide (CO) sensor, remote natural gas (methane - CH<sub>4</sub>) sensor, and remote horn strobe combo.

## 1.02 SUBMITTALS

- A. Submit product data on control panel and sensors including power requirements, wiring diagrams, dimension drawings, installation and operation manuals.

## PART 2 - PRODUCTS

## 2.01 DUAL CHANNEL SELF-CONTAINED GAS DETECTION SYSTEM

- A. Supply a dual channel, self-contained gas detection system for the monitoring of Carbon Monoxide (CO), housed in a rugged wall mount, water/dust tight ABS/PVC enclosure with hinged, secured door. The system shall have one integral electrochemical CO sensor with measurement range of 0 - 200 ppm CO in air and accommodate one remote mount, External catalytic sensor head in a Barrel type housing with measurement range of 0 - 50 % LEL in air (powered by the controller).
- B. The monitor shall provide an LED indicating light for power, low alarm, high alarm, and fault condition plus channel indication LEDs, one audible alarm and two SPDT dry contact alarm relays, each rated 5A at 240VAC. The system must be accurate enough to measure to government workplace hazardous gas exposure standards. The system shall also provide field adjustable time delays for "delays on make" and "delays on break" for each sensor to allow custom configuration of fan control by the system relays. The gas detector shall have CEF (Calibration Extending Firmware) that takes into account the aging of the CO and Combustible sensors so that less frequent calibrations are required in less-critical applications such as parking garages. Yearly sensor calibration maintenance can be achieved externally through the front door using magnetic access. The Monitor shall be UL tested for electrical safety.
- C. The controller shall provide a circuit test button to allow the user to confirm system operation and exhaust system control from the controller. The controller shall also provide a push-button to allow the user to override the system control and operate exhaust fan continuously for 15-minute segments to ventilate air in the space being monitored.
- D. System power shall be low voltage 24V (nominal) or line voltage 90-240 VAC nominal in the same enclosure. External transformer not required.

2.02 REMOTE NATURAL GAS (METHANE - CH<sub>4</sub>) SENSOR

- A. Supply a remote mount, catalytic sensor with measurement range of 0 - 50 % LEL Natural Gas (Methane - CH<sub>4</sub>). The External Sensor Head shall be housed in a "Barrel" type housing that fits into a standard electrical junction box (J-Box).
- B. The remote sensor Head shall connect to the controller with a 4 wire stranded shielded cable wire in conduit.

## 2.03 REMOTE HORN STROBE COMBO

- A. Provide remote horn strobe combo constructed of rainproof, high impact polycarbonate housing.

- B. Siren Output shall be over 100 dB.
- C. The remote mount Horn Strobe Combo shall operate on power supplied by the control panel.

#### 2.04 APPROVED MANUFACTURERS

- A. Critical Environment Technologies
- B. RKI Instruments
- C. Honeywell
- D. Bacararch

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install the dual-channel, self-contained gas detection system with integral carbon monoxide sensor in the boiler room as indicated in the Drawings. Exact location shall be coordinated in the field. Install at approximately 4 ft to 6 ft from the floor.
- B. Installation height for the natural gas (methane - CH<sub>4</sub>) sensor shall be on or near the ceiling, above the source of the natural gas (methane - CH<sub>4</sub>).
- C. Permissible area of monitoring coverage is 5,000 to 7,000 square feet per sensor for the Carbon Monoxide sensor and 2,500 to 3,500 square feet for the ESH-CCH<sub>4</sub> Catalytic methane sensor.
- D. Install the Remote Horn Strobe Combo at the entrance to the Boiler Room.
- E. The contractor shall provide all wiring, conduit and interconnection required for installation. All wiring shall be done in EMT.

#### 3.02 EXECUTION

- A. System relays shall be normally energized in non-gas-alarm state so they act in fail-safe operation.
- B. Upon detection of 25 ppm CO in air, or 10% LEL Methane (CH<sub>4</sub>) the system shall illuminate the Low alarm LED (amber) and the low gas alarm relay shall de-energize activating the exhaust system (if applicable).
- C. Upon detection of 100 ppm CO in air, or 20% LEL Methane (CH<sub>4</sub>) the system shall illuminate the High alarm LED (red), the system audible alarm shall be activated, and the high gas alarm relay shall de-energize and shut down the operation all integrated burners.
- D. The system audible alarm shall be capable of being silenced from the front panel push button.
- E. In the event of a sensor or system fail condition, the system audible alarm shall be activated and the fail LED on the front panel shall illuminate red and the relays shall de-energize, all integrated burners shall be shut down, and the ventilation system shall operate until the fail condition is resolved (if applicable).

**END OF SECTION 236002**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Dual-Channel, Self-Contained Gas Detection System.
- B. Remote Horn Strobe Combo.

## 1.02 SUBMITTALS

- A. Submit product data on control panel and sensors including power requirements, wiring diagrams, dimension drawings, installation and operation manuals.

## PART 2 - PRODUCTS

## 2.01 DUAL-CHANNEL, SELF-CONTAINED GAS DETECTION SYSTEM

- A. The dual-channel, self-contained gas detection system shall be suitable for the monitoring of Carbon Monoxide (gas engine exhaust) and Nitrogen Dioxide (diesel engine exhaust).
- B. Detection system enclosure shall be wall mounted, self-contained, of water/dust tight ABS/PVC construction with hinged, secured door and splash guard.
- C. The system shall have two integral electrochemical sensors, one Carbon Monoxide with measurement range of 0-200 ppm Carbon Monoxide in air and one Nitrogen Dioxide with measurement range of 0-10 ppm Nitrogen Dioxide in air. Area of monitoring coverage shall be up to 5,000 to 7,000 square feet per sensor.
- D. System power shall be low voltage 24V (nominal) or line voltage 90-240 VAC nominal in the same enclosure. External transformer not required.
- E. Any conduit entry into the system enclosure must utilize liquid tight conduit bus.
- F. The monitor shall provide an LED indicating light for power, low alarm, high alarm, and fault condition plus channel indication LEDs, one audible alarm and two SPDT dry contact alarm relays, each rated 5A at 240VAC. Monitor enclosure shall have a splash guard attached to the front sensor vent to prevent damage to internal sensors in wash down applications. The system must be accurate enough to measure to government workplace hazardous gas exposure standards. The system shall also provide field adjustable time delays for "delays on make" and "delays on break" for each sensor to allow custom configuration of fan control by the system relays. The gas detector shall have CEF (Calibration Extending Firmware) that takes into account the aging of the CO and NO2 sensors so that less frequent calibrations are required in less-critical applications such as parking garages. Yearly sensor calibration maintenance can be achieved externally through the front door using magnetic access. The Monitor shall be UL tested for electrical safety.
- G. The controller shall provide a circuit test button to allow the user to confirm system operation and exhaust fan control from the panel. The controller shall also provide a push-button to allow the user to override the system control and operate exhaust fans continuously for 15-minute segments to evacuate air from specific parts of the parking garage.

## 2.02 REMOTE HORN STROBE COMBO

- A. Provide remote horn strobe combo constructed in a water dust tight high impact polycarbonate housing for every 7,000 square feet of monitored area in high noise environments. Model RSH-24W

- B. Siren Output shall be over 100 dB.
- C. The remote mount Horn Strobe Combo shall operate on power supplied by the control panel.
- D. Provide Model RSH-24W Remote Horn Strobe Combo by Critical Environment Technologies or approved equal.

### 2.03 APPROVED MANUFACTURERS

- A. Critical Environment Technologies
- B. RKI Instruments
- C. Honeywell
- D. Bacararch

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install the dual-channel gas detection system as indicated in the Drawings. Exact location shall be coordinated in the field. Installation height shall be 4 feet to 6 feet from the floor.
- B. Install the Remote Horn Strobe Combo as indicated in the Drawings.
- C. The contractor shall provide all wiring, conduit and interconnection required for installation. All wiring shall be done in EMT.

### 3.02 EXECUTION

- A. The system relays shall be normally energized in non-gas-alarm state so they act in fail-safe operation.
- B. The digital display shall indicate the real time gas value.
- C. Upon detection of 25 ppm Carbon Monoxide in air or 0.7 ppm Nitrogen Dioxide in air, the system shall illuminate the Low alarm LED (amber) and the low gas alarm relay shall de-energize activating the single-speed exhaust fans or low speed of two-speed exhaust fans and open the motorized damper(s) serving the make-up air intake louver(s).
- D. Upon detection of 100 ppm Carbon Monoxide in air, or 1.5 ppm Nitrogen Dioxide in air, the system shall illuminate the High alarm LED (red), the system audible alarm shall be activated and the high gas alarm relay shall de-energize activating high speed of two-speed exhaust fans or remote alarm devices. The audible alarm shall be able to be silenced from the front panel push button.
- E. In the event of a fail condition, the system audible alarm shall be activated and the fail LED on the front panel shall illuminate red.

**END OF SECTION 236002.22**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Outdoor roof curb mounted, electronically controlled, heating and cooling unit utilizing hermetic scroll compressors with crankcase heaters for cooling duty and gas combustion for heating duty. Units shall discharge supply air vertically or horizontally as shown on contract drawings.

## 1.02 RELATED SECTIONS

- A. Sheet Metal Work: Section 233113.
- B. Division 26.

## 1.03 SUBMITTALS

- A. Submit unit performance data including: capacity, nominal and operating performance.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- E. Contract Closeout Submittals – Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director's Representative.

## 1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Unit shall be factory tested and the design, construction and installation shall be in accordance with the following: ARI Standard 210, NFPA, ASHRAE 15 (latest edition), Safety Code for Mechanical Refrigeration, and all State and Local codes or regulations having jurisdiction.
  - 2. Unit shall be listed by ETL as a total package.
  - 3. Rate cooling capacities in accordance with ARI Standard 210.
  - 4. Electrical components shall be UL listed.
  - 5. Gas heat equipped units shall be designed to conform with ANSI Standard Z21.47, Gas-Fired Central Furnaces.
  - 6. Roof curb shall be designed to NRCA criteria per Bulletin B-1986.
  - 7. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

## 1.05 PRODUCT DELIVERY

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Protect units from physical damage. Leave factory shipping covers in place until installation.
- C. Units to be secured via base rail tie-down locations.

- D. Deliver each unit as an integral factory packaged assembly.

#### 1.06 MAINTENANCE

- A. Maintenance Service: A fully equipped authorized service organization capable of guaranteeing response within 8 hours to service calls shall be available 24 hours a day, 7 days a week to service the completed Work.
- B. Extra Materials: Provide with each unit, four spare sets of air filters. Suitable box and label spare filters as to their usage.

#### 1.07 WARRANTY

- A. Provide parts warranty extending either 12-months from date of unit start-up or a maximum of 18-months from unit ship date.
- B. Provide twenty-five year heat exchanger limited warranty from unit ship date.
- C. 5 year compressor warranty for units 25 tons and below.

### PART 2 - PRODUCTS

#### 2.01 EQUIPMENT

- A. General Specification
  - 1. Unit(s) furnished and installed shall be packaged outdoor air unit(s) as scheduled on contract documents and described in these specifications. Unit(s) shall be designed for dehumidification, cooling and/or heating of 100% Outdoor Air. For dehumidification and cooling modes the evaporator temperature shall be monitored, reported at unit controller. Compressor controls shall modulate capacity to maintain evaporator leaving set point for dehumidification mode. Hot Gas Bypass shall not be used to control compressor capacity. Compressor Hot Gas Reheat (HGRH) shall be factory installed. To prevent rehydration of evaporator condensate the reheat coil face shall be located a minimum of 6" downstream from the leaving face of the evaporator coil. Heating system shall include modulating controls. Compressor on-off only or primary heating on-off only controls shall not be acceptable control strategies.
  - 2. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.
- B. Cabinet
  - 1. Cabinet panels: 2" double-wall foamed panel with thermal break construction throughout the indoor section of unit to provide nonporous, cleanable interior surfaces. All interior seams exposed to airflow shall be sealed.
  - 2. Insulation: 2" polyurethane foam metal encapsulated with no exposed edges. Initial R value of 6.6 per inch of thickness.
  - 3. Cabinet base shall be double wall construction designed to prevent trapping or ponding of water within the unit base. Cabinet base pan shall be insulated with 2" thick polyurethane foam. Foam insulation shall be fully enclosed with galvanized steel insulation cover. Insulation shall not be applied to underside of unit base.
  - 4. Cabinet Base Rails: Side and end base rails shall include openings for forklift and tie-down access. To protect unit base from fork damage side rails shall include removable heavy gauge fork pockets.
  - 5. Shipping anchors attach to and/or through unit base rails. Straps over unit shall not be used to secure unit for shipping.

6. Cabinet material interior and base rails: shall be G-90 zinc-coated galvanized steel. Material gauge shall be a minimum of 14-gauge for base rails, 16-gauge for structural members and 22-gauge for access doors and cabinet panels.
  7. Exterior Corrosion Protection: Exterior cabinet panels shall be a base coat of G-90 galvanized steel with both exterior and interior surfaces cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Unit's surface shall be in compliance with ASTM B45 salt spray testing at a minimum of 627 hour duration.
  8. Cabinet construction shall provide hinged panels providing easy access for all parts requiring routine service.
  9. Cabinet top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket-sealed.
  10. Hinged Access Panels: Water- and air-tight hinged access panels shall provide access to all areas requiring routine service including air filters, heating section, electrical and control cabinet sections, optional ERV and power exhaust fan section, supply air fan section, evaporator and reheat coil sections. Insulated doors shall be constructed to allow the access door to open in either direction or be removed without removal of a hinge.
    - a. Hold-open devices shall be factory installed on all hinged access doors. Chains shall not be used as hold-open devices.
    - b. Latches with locking hasp or tool operated closure devices shall be factory installed on all hinged access panels.
  11. Drain Pan material shall be Type 304 Stainless steel drain and constructed to slope in two directions to ensure positive drainage with corners exposed to standing water and drain fittings welded liquid tight to prevent leaks. Pan shall have a minimum depth of 2". Base of drain pan shall be insulated with 1" thick foam insulation minimum.
  12. Provide openings either on side of unit or thru the base for power, control and gas connections.
  13. Cabinet shall include optional interior liner constructed of Type 304 stainless steel with sealed seams.
  14. Air inlet hood shall be factory installed and shall not require field assembly. Hood shall include 2" thick removable aluminum mesh mist eliminators sized for a velocity not to exceed 500 FPM at maximum unit rated airflow. Service access shall be hinged and held in place with thumb latches that shall not require tools for service access.
  15. Unit shall be equipped with a 6" filter rack upstream of the evaporator. Frame shall be field-adjustable to match any filter combination specified in the following section.
- C. Air Filters
1. Unit inlet hood shall include 2" thick aluminum mesh removable mist eliminators with hinged access cover. Inlet velocity shall not exceed 500 FPM.
  2. Evaporator Inlet shall include a full complement of pleated media air filters. Filters shall be:
    - a. 2" deep MERV 13
- D. Dampers
1. Unit shall include a motor operated outdoor air damper constructed of galvanized steel.
  2. Damper blades shall be v-groove design with rubber edge seals designed not to exceed a 4 CFM/SQ FT leakage rate exceeding ASHRAE 90.1 damper leakage requirements.
  3. Damper actuator shall be factory mounted and wired sealed spring return and either two-position or fully modulating.
  4. Dampers air velocity shall not exceed 2000 fpm.
- E. Compressors
1. All units shall have direct-drive, scroll type compressors.
  2. Optional Digital Scroll Compressor
    - a. Circuit One and Circuit Two
  3. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage.

4. Internal overloads shall be provided with the scroll compressors.
  5. Each compressor shall have a crankcase heater or equivalent to minimize the amount of liquid refrigerant present in the oil sump during off cycles.
  6. Each compressor shall be mounted on rubber vibration isolators, to reduce the transmission of noise.
  7. Provide each unit with hermetically sealed refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, liquid line charging port, suction and liquid line pressure ports, sight glass, and thermal expansion valve.
  8. Provide each circuit with automatic reset high and low pressure and high temperature switches for safety control.
- F. Coils
1. Evaporator, Condenser and Hot Gas Reheat coils shall be constructed with copper tubes mechanically bonded to configured aluminum plate fins.
  2. Coils shall be factory leak tested in accordance ANSI/ASHRAE 15-1992 at a minimum pressure of 500 PSIG.
  3. The condenser coil shall have a fin designed for ease of cleaning.
  4. Evaporator coil shall include (six / four) rows of cooling interlaced for superior sensible and latent cooling with a maximum of 14 FPI for ease of cleaning.
  5. Reheat coil shall be fully integrated into the supply airstream and be capable of delivering design supply air temperature.
  6. To prevent re-hydration of condensate from evaporator coil, the evaporator coil face and the hot gas reheat coil face shall be separated by a minimum of six inches.
  7. Condenser coil hail guards shall be factory installed.
- G. Condenser Section
1. Outdoor Fans: Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and electro-plated motor mounting brackets.
  2. Fans shall be statically and dynamically balanced.
- H. Compressor Capacity Control
1. (Mechanical Control: shall be equipped with Refrigerant Capacity Control (RCC) on the lead circuit to modulate compressor capacity during Dehumidification or Cooling modes to prevent evaporator frosting or freezing. RCC shall be (standard mechanical). Hot gas by pass shall not be an acceptable compressor capacity control strategy. The RCC setpoint is factory set, and field adjustable, to maintain desired suction pressure and compressor discharge pressure.
    - a. Electronic Control: (Requires Digital Scroll Compressor or Variable Speed Compressor be selected in compressor section of this specification.) Compressor output capacity shall be controlled by the Main Control Module. (refer to unit control and sequence sections of this specification)
- I. Fans and Motors
1. Indoor fan shall be direct drive plenum fan, factory installed and wired to on-board Variable Frequency Drive and shall be equipped with slide out service access.
  2. All fan motors shall be premium efficiency ODP and meet the U.S. Energy Policy Act of 2005/10 (EPACT).
  3. All fan motors shall either be permanently lubricated and/ or have internal thermal overload protection.
  4. Outdoor fans shall be direct drive with premium efficiency motors, statically and dynamically balanced, draw through in the vertical discharge position.
  5. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
- J. Modulating Indirect Gas Fired Heating Systems

1. Completely assembled and factory installed heating system shall be located in the primary heating position located beneath the indoor fan assembly and be integral to unit and approved for use downstream from refrigerant cooling coils in units mounted outdoors. Threaded gas connection shall terminate at field provided manual shut-off valve. Provide capability for sidewall gas piping.
  2. Heaters shall include high turn-down burners firing into individual stainless steel tubular heat exchangers. Heat exchangers shall be constructed of type 439 stainless steel and be a high efficiency dimpled tubular design capable of draining internal condensate. Units with multiple heaters shall include one fully modulating high turndown heater with additional on-off heater sections. Total heater turndown shall be based on heater gas input capacity 5:1 when <150 MBH or a minimum of 10:1 when >150 MBH.
  3. Heater outdoor air inlet shall be hooded and include internal baffle system to prevent rain blow thru. To prevent recirculation of flue gas and to prevent flue gas condensate from draining onto and obstructing the heater air inlet the inlet shall be hooded and shall be located a minimum of 8" beneath the flue outlet. Inlet hood shall include bird screen.
  4. Heater flue outlet(s) shall include hooded outlet with wire cloth all constructed of Type 430 stainless steel. Hooded outlet shall be sealed to prevent flue gas recirculation.
  5. Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, continuous air proving monitoring following ignition and continuous electronic flame supervision.
  6. Unit controls shall monitor heat output and shall discontinue all heating attempts and or unit operation in the event the heating section fails to ignite or fails to maintain programmed supply air temperature/time.
  7. Inducer fan shall be direct drive high pressure centrifugal type with two speeds and shall include built- in thermal overload protection.
  8. Limit controls: High temperature automatic reset limits shall be located on blower wall and in indoor fan chamber to shut off gas flow in the event of excessive temperatures resulting from restricted indoor airflow, or loss of indoor airflow.
  9. Flame roll-out safeties shall provide continuous monitoring of proper burner operation.
- K. Electrical Ratings and Connections
1. All high voltage power components such as fuses, switches and contactors shall include a service personnel protection barrier or shall be a listed as touch-safe design.
  2. Field wiring access to be provided thru unit base into isolated enclosure with removable cover.
  3. Power wiring to be single point connection.
  4. Wiring internal to the unit shall be colored and numbered for identification.
  5. Unit shall be factory wired to field wiring terminal block mounted in isolated enclosure.
  6. Factory wired main power disconnect and overcurrent device shall be rated for total unit connected power
  7. Unit SCCR rating shall be a minimum of 5kA
  8. Optional unit SCCR rating shall be a minimum of 65kA
  9. Factory wired Voltage/Phase monitor shall be included as standard. In the event of any of the following, the units will be shut down and a fault code will be stored in the monitor for the most recent 25 faults. Upon correction of the fault condition the unit will reset and restart automatically.
    - a. Phase Unbalance Protection: Factory set 2%
    - b. Over/Under/Brown Out Voltage Protection: +/-10% of nameplate voltage
    - c. Phase Loss/Reversal
  10. Factory to mount and wire optional 120 volt convenience outlet. Field wiring of convenience outlet not acceptable.
  11. All low voltage field wiring connections shall be made at factory installed low voltage terminal strip.

L. Unit Controls

1. Main Unit Controller (MCM) shall be a microprocessor based controller with resident control logic. Controller program logic shall include
    - a. Include single program with field selectable
      - 1) Discharge Air control with unit conditioning modes enabled based on outdoor air conditions and controlled to maintain discharge air setpoints.
      - 2) Space control with unit conditioning modes enabled and controlled to maintain space setpoints.
    - b. Multi-Zone Variable Air Volume Control (MZVAV) with unit conditioning modes enabled based on discharge air temperature setpoint and supply fan controlled within design minimum and maximum performance ratings to maintain a duct pressure setpoint monitored by the factory furnished, field installed duct pressure sensor.
  2. MCM shall:
    - a. Prevent simultaneous operation of any conditioning modes.
    - b. Accept separate setpoints for Occupied and Unoccupied states.
    - c. Call for Dehumidification based on dew point setpoints. When no call for Dehumidification is present MCM shall control calls for Cooling, Heating and Economizer modes based on sensible or enthalpy temperature setpoints. MCM shall have onboard clock and scheduling function for occupancy.
    - d. Include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
    - e. Enable HGRH dehumidification and cooling modes and control modulation to maintain (discharge air temperature / space temperature).
    - f. Unit shall include minimum discharge air control.
  3. System Sensors shall include: Factory installed and wired Outdoor Air Temperature, Outdoor Air Humidity and Evaporator Leaving Air Temperature and factory furnished, field installed Discharge Air Temperature.
    - a. Space Control or Single Zone VAV: Factory shall furnish Space Temperature and Space Humidity sensor for field installation and connection to the unit
    - b. Economizer Option includes Return Air Temperature and Humidity sensor
    - c. ERV Option includes exhaust air leaving temperature sensor
    - d. Powered Exhaust with Economizer includes duct pressure sensor to be field installed.
  4. System controls shall include:
    - a. Anti-cycle timing.
    - b. Minimum compressor run/off-times.
  5. Optional Smoke Detectors to sense (Return Air / Discharge Air / Return and Discharge Air) stream(s) shall be factory installed and wired.
- M. Power Exhaust
1. Provide a factory installed power exhaust assembly that shall be designed to ventilate return air to atmosphere.
  2. Plenum mounted direct drive airfoil design exhaust wheel material shall be heavy gauge aluminum, welded construction and rated for up to Class III speed/pressure performance. Factory install and wire fan motor to on-board Variable Frequency Drive. Belt-drive and/or forward curve plenums fans shall not be used.
  3. Exhaust to discharge through powered isolation dampers located on each side of unit cabinet.
- N. Outdoor Air Section Energy Recovery
1. The rotor media shall be made of aluminum, formed into a honeycomb structure to minimize pressure loss and avoid plugging. Paper, plastic or fibrous media are not acceptable. The rotor media must be coated to resist corrosion. All surfaces must be coated with a non-migrating desiccant layer to insure that adequate latent capacity is provided. The desiccant coating must be firmly bonded to the aluminum surface and will not be dislodged when challenged with high velocity air up to 5000 feet per minute. Products that lose desiccant when served with high velocity air are not acceptable. The



- cassette must be a slide out design for serviceability. The media shall be cleanable with low temperature steam, hot water or light detergent without degrading the latent recovery.
2. Sensible and latent recovery efficiencies must be clearly documented through a testing program conducted in accordance with ASHRAE Standard 84 and AHRI 1060. The testing must have been conducted by a qualified independent organization. The performance test reports must be provided for engineering review as part of the submittals for this project.
  3. The rotor design shall ensure laminar airflow to minimize parasitic pressure loss and to optimize the operating efficiency of the system fans. The pressure loss across the media shall be no greater than the scheduled pressure loss values. The energy wheel shall operate effectively up to 180 degrees F.
  4. The rotor media shall be permanent, with an anticipated life of 20 years. It must be tested in accordance with ASTM Standard E-84 and provide smoke and flame spread ratings of less than 25 and 50 as required by NFPA 90A and UL 1995. A copy of the ASTM E-84 test report confirming the method of test and results shall be provided with the submittal. Heat recovery wheels incorporating "throw-away" media and tested to UL900 for Class 2 filters are not acceptable.
  5. The wheel manufacturer must have been producing energy recovery wheels for a minimum of ten years.
  6. The rotor shall be supplied with perimeter brush seals and face contact seals to minimize air leakage and wheel bypass.
  7. The rotor media shall be supported by a structural aluminum hub and aluminum reinforcing spoke system. The rotor bearings must be greaseable and provide L10 life in excess of 20 years.
  8. The cassette framework shall be made of galvanized steel to prevent corrosion.
  9. The rotor must be driven by long-life polyurethane/polyester composite link belt system. The rotor/cassette shall be designed so that belt can be removed or serviced without the removal of the bearing. A 3 phase A/C gear motor shall be utilized to accommodate variable speed applications.
- O. Roof Curb
1. Contractor shall provide factory supplied 14" tall roof curb, 18 gauge perimeter made of zinc coated steel with supply and return air gasketing and wood nailer strips. Ship knocked down and provided with instructions for easy assembly.
  2. Curb shall be manufactured in accordance with the National Roofing Contractors Association guidelines
- P. Approved Manufacturers:
1. LG
  2. Trane
  3. Carrier
  4. York
  5. Approved equal.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Roof Curbs:
1. Install curbs in complete accordance with the manufacturer's printed instructions, and as indicated.
  2. Deliver roof curbs to construction contractor for installation.
- B. Air Conditioners:
1. Install equipment on roof curbs in complete accordance with the manufacturers' printed instructions, and as indicated.

2. Provide all piping, electrical and ductwork connections to equipment through roof curb openings under units.

### 3.02 FIELD QUALITY CONTROL

- A. Preliminary Requirements: Employ the services of a Company Field Advisor of the rooftop air conditioner manufacturer for the following:
  1. Inspect air conditioner installations prior to start-up.
  2. Supervise initial start-up of machine.
  3. Instruction of State Personnel.
  4. Service.
- B. Pre-Start-Up, Start-Up and Instruction: Upon completion of the installation of the air conditioner, to the satisfaction of the Company Field Advisor, start-up and preliminary testing shall be accomplished under the Company Field Advisor's supervision. When all necessary adjustments have been made and air conditioner is properly operating, the Company Field Advisor shall instruct State Personnel in the operation and maintenance of the air conditioner and accessories.

**END OF SECTION 237433**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Unit(s) furnished and installed shall be packaged rooftop(s) as scheduled on contract documents and these specifications. Cooling capacity ratings shall be based on AHRI Standards. Unit(s) shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors and unit controls.

## 1.02 RELATED SECTIONS

- A. Section 233113 - Sheet Metal Work.
- B. Division 26.

## 1.03 SUBMITTALS

- A. Submit unit performance data including: capacity, nominal and operating performance.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit shop drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- E. Contract Closeout Submittals - Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director's Representative.

## 1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Unit shall be factory tested and the design, construction and installation shall be in accordance with the following: ARI Standard 210, NFPA, UL, ASHRAE 15, Safety Code for Mechanical Refrigeration, and all State and Local codes or regulations having jurisdiction.
  - 2. Unit shall be listed by ETL as a total package.
  - 3. Unit shall be rated in accordance with AHRI Standard 210/240 and 340/360.
  - 4. Electrical components shall be UL listed.
  - 5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
  - 6. Unit shall meet ASHRAE 90.1 minimum efficiency requirements.
  - 7. 3 phase units shall be Energy Star certified.

## 1.05 PRODUCT DELIVERY

- A. Deliver each unit as an integral factory packaged assembly.
- B. Unit shall be stored and handled per manufacturer's recommendations.
- C. Unit shall only be stored or positioned in the upright position.

## 1.06 WARRANTY

- A. Provide parts warranty (excluding refrigerant) for one year from start-up or 18 months from shipment, whichever occurs first.
- B. Provide five-year extended warranty for compressors.
- C. Provide ten-year heat exchanger limited warranty.

## 1.07 MAINTENANCE

- A. All work on units shall be accomplished by OEM factory trained and authorized servicing technicians.
- B. Provide quarterly, annual and bi-annual maintenance in compliance with or exceeding ASHRAE Standards
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data.
- D. Submit copies of service call work order or report and include description of work performed.
- E. Extra Materials: Provide with each unit, four spare sets of air filters. Suitable box and label spare filters as to their usage.

## PART 2 - PRODUCTS

## 2.01 ELECTRIC COOLING PACKAGED ROOFTOP UNITS

- A. General
  - 1. Unit(s) shall be 100% factory run tested and fully charged with R-410A.
  - 2. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.
  - 3. Units shall be convertible airflow design as manufactured.
  - 4. Wiring internal to the unit shall be colored and numbered for identification.
  - 5. All units shall be manufactured in a facility certified to ISO 9001 standards and the cooling performance shall be rated in accordance with DOE and AHRI test procedures. Units shall be CSA listed, classified to ANSI Z21.47 standards, UL 1995/CAN/CSA No. 236-M90 conditions.
- B. Unit casing
  - 1. Cabinet: Galvanized steel, phosphatized, and finished with a pre-applied baked polyurethane enamel. Structural members with access doors and removable panels shall be a minimum 22 gauge.
  - 2. Unit's cabinet surface shall be tested 750 hours in salt spray test in compliance with ASTM -B117.
  - 3. Cabinet construction shall allow for all service/ maintenance from one side of the unit.
  - 4. Cabinet top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket-sealed.
  - 5. Access Panels: "Large" size, water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.
  - 6. Unit's base pan shall have a raised 1 1/8 inch high lip around the supply and return openings for water integrity.

7. Condensate pan shall be internally sloped and conform to ASHRAE 62-89 self- draining standards. Condensate connection shall be a minimum of 1" I.D. female and be a ridged mount connection.
  8. Provide minimum ½ inch foil faced, fire retardant permanent, odorless glass fiber material. All edges must be captured so that there is no insulation exposed in the air stream.
  9. The base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high down flow supply/return openings to provide and added water integrity precaution.
  10. Provide openings either on side of unit or through the base for power, control, condensate, and gas connections.
  11. The base of the unit shall have 3 sides for forklift provisions. The base of the units shall have rigging/lifting holes for crane maneuvering.
- C. Air Filters
1. Air Filters: Factory installed filters shall mount integral within the unit and shall be accessible through access panels. Two-inch thick glass fiber disposable media filters shall be provided. Unit filter track shall be designed to accommodate either 2" or 4" filters.
  2. Two inch MERV 8 and MERV 13 media filters shall be available option.
- D. Fans and Motors
1. Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.
  2. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.
  3. All 10 tons, 6 ton (074), 7½ to 8½ ton high efficiency units shall be equipped with a direct drive plenum fan design. Plenum fan design shall include a backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor. All plenum fan designs will have a variable speed adjustment potentiometer located in the control box.
  4. Outdoor and Indoor Fans shall be permanently lubricated and have internal thermal overload protection.
  5. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.
  6. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
  7. Fan performance measuring ports shall be provided on the outside of the cabinet to allow accurate air measurements of evaporator fan performance without removing panels or creating air by-pass of the coils.
- E. Hot Water Heating Coil
1. Hot Water Coil: Extended surface type, utilizing aluminum fins and DLP-type copper tubes with cast bronze supply and return connections. Coils shall be of serpentine design with horizontal tubes, vertical fins, and center supply and return connections. All tube bends shall be brazed. Tubes shall be mechanically bonded to the collars of the fins. Coils shall be capable of operating at hot water pressures and temperatures of 150 psig and 375 deg F.
- F. Evaporator Coil & Section
1. Provide configured aluminum fin surface mechanically bonded to copper tubing coil.
  2. Provide an independent expansion device for each refrigeration circuit. Factory pressure tested at 600 psig and leak tested at 465 psig.
  3. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.
  4. Provide clogged Filter Switch. The indication will be registered with either a zone sensor with status indication lights or an integrated comfort system. This option is available for microprocessor controlled units.

5. Provide Fan Failure Switch. The indication will be registered with either a zone sensor with status indication lights or an integrated comfort system. This option is available for microprocessor controlled units.
6. Provide Discharge Air Sensing Tube
7. Provide Novar Return Air Sensor
8. Provide Novar Zone Temp sensor
9. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of Stainless Steel
10. Unit shall include a condensate overflow switch to shut the unit down in the event that a clogged condensate drain line prevents proper condensate removal from the unit.

G. Condenser Section

1. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.
  - a. Micro channel coil has flat streamlined tubes with small ports, and metallurgical tube to fin bond. Microchannel coil has better heat transfer performance. Microchannel condenser coil can reduce system refrigerant charge by up to 50% because of smaller internal volume, which reduces the unit weight. These all aluminum coils are recyclable. Galvanic corrosion is also minimized due to all aluminum construction. Strong aluminum brazed structure provides better fin protection and quality. In addition, flat streamlined tubes also make Microchannel coils more dust resistant and easier to clean.
  - b. Microchannel condenser coils are standard for all 3 to 10 ton standard efficiency models and 4,5,6, 7½, 8½ ton high efficiency models. The Microchannel type condenser coil is not offered on the 4 and 5 ton dehumidification model.
  - c. Tube and fin condenser coils are standard on the 3 and 5 ton EFLEX model. 4 ton is Microchannel.
  - d. Tube and fin condenser coils are standard on the 17 Plus models.
2. Provide tool-less factory installed corrosion resistant louvered hail/vandalism guards to protect condenser coils from hail or physical damage.
3. Provide corrosion protected Condenser Coil Option that shall include an all-aluminum Microchannel. Condenser coil protection shall consist of a corrosion resistant coating that shall withstand ASTM B117 Salt spray test for 6000 Hours and ASTM G85 A2 cyclic Acidified salt for test for 2,400 hours. This coating shall be added after coil construction covering all tubes , headers and fin edges, therefore providing optimum protection in more corrosive environments

H. Refrigeration System

1. All units shall have direct drive hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate. Compressors shall be internally protected with internal high-pressure relief and over temperature protection. Compressors shall have internal spring isolation and sound muffling to minimize vibration and noise, and be externally isolated on a dedicated, independent mounting.
2. 17 Plus series shall be 2 stage scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate.
3. Eflex variable speed compressor shall be capable of speed modulation from 15Hz to a maximum of 60Hz. The minimum unit capacity shall be 25% of full load. The compressor motor shall be a permanent magnet type. Each variable speed compressor shall be matched with a specially designed refrigerant cooled , variable frequency drive which modulates the speed of the compressor motor and provides several compressor protection functions.

4. Provide with thermostatic temperature motor winding control for protection against excessive temperatures caused by over/under voltage operation or loss of charge. Also provide high and low pressure switches.
  5. Thermal Expansion valves are standard for all models.
  6. Units shall have cooling capabilities down to 0 degree F as standard with microprocessor controls (40 degrees F with electromechanical controls. For field-installed low ambient accessory, the manufacturer shall provide a factory-authorized service technician that will assure proper installation and operation.
  7. Provide each unit with <<CIRCUIT\_AMOUNT>> refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.
- I. Exhaust/Return Section
1. Provide, on down flow units from 3-10 tons above a factory supplied field installed power exhaust assembly that shall assist the barometric relief damper in the economizer in relieving building pressurization.
  2. Supply, Return and Plenum air smoke detector: If smoke is detected all unit operation will be shut down. Reset will be manual at the unit.
- J. Outdoor Air Section
1. Provide No fresh air 100% return air.
  2. Manual outside air damper 0-50%
  3. Low leak Economizer with <<economizer features>> dampers shall be provided with airfoil blades. Dampers shall have a leakage rate of 3 CFM/sq-ft a 1.0 in WC differential.
  4. Provide Fault Detection and Diagnostics (FDD) control.
  5. Motorized outside air damper 0-50%
  6. Provide economizer with <<ECONOMIZER\_FEATURES>>.
  7. Provide adjustable minimum position control located in the economizer section of the unit.
  8. Provide spring return motor for outside air damper closure during unit shut down or power interruption.
  9. Provide Remote Potentiometer for minimum position setting of the economizer
- K. Operating Controls
1. General: Microprocessor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and ventilation decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from setpoint and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.
  2. SZ VAV: Provide all necessary controls to operate a rooftop unit based on maintaining two temperature setpoints: discharge air and zone. During one zone vav cooling, the unit will maintain zone cooling setpoint by modulating the supply fan speed more or less to meet zone load demand; and the unit will maintain discharge temperature to the discharge cooling setpoint by modulating economizer if available and staging dx cooling.
  3. Provide a Human Interface that shall have a 5 inch color touchscreen display that conforms to fcc part 15 class B with an Ingress protection rating of IP24. The display text shall be readable by a person with 20/20 vision at a distance of 3 ft and 60 degree angle at lighting levels ranging from 100 lux-25000 lux. Also, the display shall operate at the temperatures of -40 centigrade to 70 deg centigrade.
  4. Clogged filter indication: Provide factory installed differential pressure switch to indicate filter replacement status. Differential pressure switch shall cause a contact closure to display a service indication and unit will continue to operate normally
  5. RTU-1&2: Provide Wall or duct mounted CO2 sensor to monitor space occupancy levels within the building by measuring the parts per million of CO2 (Carbon Dioxide) in the air. As CO2 Levels increase, the economizer fresh air damper shall modulate to meet the CO2 space ventilation requirements.

6. Provide Wall mounted humidity Sensor.
7. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.
8. Economizer Preferred Cooling (if supplied with economizer) - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

L. Electrical Requirements

1. Phase Monitoring Protection: units with 3-phase power are equipped with phase monitoring protection as standard.
2. Through the base electrical with disconnect switch will be installed in the unit in a water tight enclosure with access through a swinging door. Wiring will be provided from the switch to the unit high voltage terminal block. The switch will be cULus agency recognized.
3. Through the base Electrical with circuit Breaker: A thermal magnetic, molded case, HSCR circuit breaker with provisions for through the base electrical connections. The circuit breaker will be installed in a water tight enclosure in the unit with access through a swinging door. Wiring will be provided from the switch to the unit high voltage terminal block. The circuit breaker will provide overcurrent protection, be sized per NEC and cULUS guidelines, and be agency recognized by cULus.
4. Through the Base Electrical Access: An electrical service entrance shall be provided allowing electrical access for both control and power connects inside the curb and through the base of the unit.
5. Powered Convenience outlet: A GFCI 120V/15 amp, 2 plug, convenience outlet. A service receptacle disconnect will be available. The convenience outlet is powered from the line side of the disconnect or circuit breaker, and will not be affected by the position of the disconnect or circuit breaker. This option can only be ordered when the through the base electrical option is ordered.
6. Wiring internal to the unit shall be colored and numbered for identification.

M. Factory Installed Options:

1. Hot gas reheat dehumidification [where specified]
2. Dirty Filter Switch - This factory mounted kit includes a differential pressure switch that energizes the fault light on the unit thermostat, indicating that there is an abnormally high pressure drop across the filters.
3. Phase Monitor - Designed to prevent unit damage. The phase monitor will shut the unit down in an out-of phase condition.
4. condenser hail Guard
5. Powered GFI Convenience Outlet
6. Low leak comparative enthalpy economizer.
7. Hinged access doors
8. 2" Pleated Filters, MERV 13
9. Disconnect Switch - For gas heat units and cooling units with electric heat, a HACR breaker sized to the unit is provided.

N. Approved Manufacturers:

1. Tempmaster
2. LG
3. Trane
4. Carrier
5. York
6. Approved equal.



## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. Air Conditioners:
  - 1. Install equipment in complete accordance with the manufacturers' printed instructions, and as indicated.
  - 2. Install with 14" curbs as shown on drawings.

## 3.02 FIELD QUALITY CONTROL

- A. Preliminary Requirements: Employ the services of a Company Field Advisor of the rooftop air conditioner manufacturer for the following:
  - 1. Inspect air conditioner installations prior to start-up.
  - 2. Supervise initial start-up of machine.
  - 3. Instruction of State Personnel.
  - 4. Service.
- B. Pre-Start-Up, Start-Up and Instruction: Upon completion of the installation of the air conditioner, to the satisfaction of the Company Field Advisor, start-up and preliminary testing shall be accomplished under the Company Field Advisor's supervision. When all necessary adjustments have been made and air conditioner is properly operating, the Company Field Advisor shall instruct State Personnel in the operation and maintenance of the air conditioner and accessories.

**END OF SECTION 238100**

## PART 1 - GENERAL

## 1.01 SYSTEM DESCRIPTION

- A. The Air Conditioner or heat pump system shall be a split system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall mounted, and/or wireless wall mounted controller.

## 1.02 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.
- D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001.
- E. A dry air holding charge shall be provided in the indoor section.
- F. A pressure charge of R410A refrigerant sufficient for up to twenty-five (25) feet of refrigerant tubing shall be provided in the outdoor condensing unit.

## 1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.
- B. The wireless controller shall be shipped inside the carton with the indoor unit able to withstand 105 degree F storage temperatures and 95% relative humidity without adverse effect.

## 1.04 WARRANTY

- A. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
- B. Manufacturer shall have over 30 years of continuous experience in the U.S. market.

## 1.05 SUBMITTALS

- A. Submit manufacturer's product data including capacity of unit, electrical requirements, airflow, sound pressure data, indoor and outdoor unit measurements, weight, control schematics, and wiring diagrams.

## PART 2 - PRODUCTS

## 2.01 APPROVED MANUFACTURERS

- A. LG
- B. Mitsubishi/Trane

## C. Daikin

## 2.02 WALL MOUNTED INDOOR UNIT

## A. General

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired wall-mounted, wireless wall-mounted or wireless handheld controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry air before shipment from the factory.

## B. Unit Cabinet

1. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

## C. Fan

1. The indoor unit fan shall be high performance, double inlet, forward curve, direct drive type fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

## D. Vane

1. There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

## E. Filter

1. Return air shall be filtered by means of a removable washable filter.

## F. Coil

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. All tube joints shall be brazed. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
2. A drain pan level switch, designed to connect to the control board, shall be provided and installed on the condensate pan to prevent condensate from overflowing.
3. A condensate mini-pump shall be provided to provide a means of condensate disposal.

## 2.03 OUTDOOR UNIT

## A. General

1. The outdoor unit shall be compatible with the associated indoor unit. The connected indoor unit shall be of the same capacity as the outdoor unit.
2. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.
3. The outdoor unit shall be capable of cooling operation down to 0°F ambient temperature without additional low ambient controls. A wind baffle shall be provided with the unit.
4. The outdoor unit shall be completely factory assembled, piped, wired, and tested.

## B. Cabinet

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.
  2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.
  3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
  4. The fan grill shall be of ABS plastic.
- C. Fan
1. Unit shall be furnished with a DC fan motor.
  2. The fan motor bearings shall be permanently lubricated.
  3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.
- D. Coil
1. The condenser coil shall be of copper tubing with aluminum fins. The coil shall be protected with an integral metal guard.
  2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be control by a microprocessor controlled step motor.
  3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E84 and CAN / ULC S-102.
- E. Compressor
1. The compressor for wall mounted units shall be a Frame Compliant Scroll compressor with Variable Speed Inverter Drive Technology. The compressor recessed units shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.
  2. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.
  3. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
  4. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Install all equipment, piping, and controls in accordance with manufacturer's installation instructions.
- B. Install refrigerant piping as per manufacturer's instructions and specification.
- C. Mount the outdoor condensing unit on a concrete equipment pad.

- D. Support the indoor unit as per the manufacturer's instructions.
- E. Mount the controller. Coordinate exact location with the owner.
- F. Install the drain line. Pitch drain line in the direction of flow.
- G. Install new filter on indoor unit.
- H. Clean all equipment after installation.

**END OF SECTION 238126**

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

- A. The variable capacity, heat pump air conditioning system shall consist of multiple evaporators, refrigerant pipe joints and headers, a two-pipe refrigeration distribution system using PID control, and an air-cooled condensing unit. The condensing unit shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit shall be capable of connection to an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones shall each be capable of operating separately with individual temperature control.
- B. The condensing unit shall be interconnected to indoor unit models in accordance with the manufacturer's recommendations. The indoor units shall be connected to the condensing unit utilizing manufacturer approved piping joints and headers to ensure correct refrigerant flow and balancing. T- style joints are not acceptable.
- C. Operation of the system shall permit either cooling or heating of all of the indoor units simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.
- D. An outdoor air shall be delivered to the system via an energy recovery ventilator. The energy recovery ventilator shall incorporate a high-efficiency paper, cross-flow heat exchanger core in order to provide both sensible and latent heat recovery.

1.02 SYSTEM DESCRIPTION

- A. Advanced Zoning - A single system shall provide for up to 62 zones.
- B. Autocharging - Each system shall have a refrigerant auto-charging function.
- C. Oil Return Heating - Each system shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
- D. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve for independent control.
- E. VFD Inverter Control - Each condensing unit shall use a high efficiency, variable speed "inverter" compressor coupled with inverter fan motors for superior part load performance.
- F. Compressor capacity shall be modulated automatically to maintain constant suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads.
- G. Indoor units shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
- H. Flexible Design
  - 1. Systems shall be capable of up to 540 ft. (640 ft. equivalent) of linear piping between the condensing unit and furthest located indoor unit.
  - 2. Systems shall be capable of up to 3,280 ft. total "one-way" piping in the piping network.
  - 3. Systems shall have a vertical (height) separation of up to 295 ft. between the condensing unit and the indoor units.
  - 4. Systems shall be capable of up to 295 ft. from the first branch point.

5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit capacity.
6. Systems shall be capable of 49 ft. between indoor units.
7. Condensing units shall be supported with a fan motor ESP up to 0.32" WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
- I. Simple Wiring - Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring.
- J. Advanced Diagnostics - Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.
- K. Each condensing unit shall incorporate contacts for electrical demand shedding.
- L. Advanced Controls - Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
- M. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.

### 1.03 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 - Heating and Cooling Equipment, and shall bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.
- D. The system shall be manufactured in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. The condensing unit shall be factory charged with R410A refrigerant.
- F. The energy recovery ventilator shall be certified in accordance with Air Conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 1060 and bear the AHRI Certified label.
- G. The energy recovery heat exchanger core shall be tested in accordance with Underwriters Laboratories (UL) 723 and shall have a flame spread rating of not more than 25, and a smoke developed rating of not more than 50.
- H. The energy recover system efficiency shall meet or exceed 65% thermal efficiency and 40% enthalpy recovery efficiency.

### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be stored and handled according to the manufacturer's recommendations.

### 1.05 WARRANTY

- A. Condensing Unit
  1. The manufacturer shall warrant to the customer who is the original owner and user of the products specified above ("Customer") that under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from

defects in material or workmanship. This warranty shall apply to parts only and is limited in duration to one (1) year from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment. Customer must present proof of the original date of receipt and of installation of the Product in order to establish the effective date of this warranty. Otherwise the effective date will be deemed to be the date of manufacture plus sixty (60) days. Repaired or replacement parts shall be warranted for the balance of the warranty period applicable to the original part following the date on which the repaired or replacement part is provided to the Customer.

2. For its compressors only, the manufacturer shall provide the above warranty (which is applicable to parts only) for a seven (7) year period. This extended warranty for compressors shall be limited in duration to seven (7) years from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment, and applies to the compressor and compressor parts only. The effective date of this extended warranty shall be established as above.

**B. Indoor Unit**

1. The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of seven (7) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of the manufacturer according to their terms and conditions. All warranty service work shall be performed by a manufacturer factory trained service professional.

**C. Energy Recovery Unit**

1. The manufacturer shall warrant to the customer who is the original owner and user of the products specified above ("Customer") that under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material or workmanship. This warranty applies to parts only and is limited in duration to one (1) year from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment. Customer must present proof of the original date of receipt and of installation of the Product in order to establish the effective date of this warranty. Otherwise the effective date will be deemed to be the date of manufacture plus sixty (60) days. Repaired or replacement parts are warranted for the balance of the warranty period applicable to the original part following the date on which the repaired or replacement part is provided to the Customer.
2. For the core only, the manufacturer shall provide the above warranty for a six (6) year period. This extended warranty for the core is limited in duration to six (6) years from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) twenty-four (24) months from the date of shipment. The effective date of this extended warranty shall be established as above.

**D. System Installation Requirements**

1. The system must be installed by a factory trained contractor/dealer. The bidders shall be required to submit training certification proof with bid documents. The mechanical contractor's installation price shall be based on the systems installation requirements. The mechanical contractor bids with complete knowledge of the HVAC system requirements. Untrained contractors who wish to bid this project shall contact the manufacturer to arrange training prior to bid day.



## 1.06 SUBMITTALS

- A. Submit manufacturer's product data including capacity of unit, electrical requirements, airflow, sound pressure data, indoor and outdoor unit measurements, weight, control schematics, and wiring diagrams.

## PART 2 - PRODUCTS

### 2.01 DESIGN BASIS

- A. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein. In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation.

### 2.02 CONDENSING UNIT

- A. General: The condensing unit shall be designed specifically for use with a variable refrigerant volume system.
  - 1. The condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
  - 2. Liquid and suction lines shall be individually insulated between the condensing and indoor units.
  - 3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
  - 4. The condensing unit shall be able to support the connection of multiple indoor units.
  - 5. The system shall automatically restart operation after a power failure. System settings shall be saved in the event of a power loss without the need for reprogramming.
  - 6. The unit shall incorporate an auto-charging feature.
  - 7. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
  - 8. The following safety devices shall be included on the condensing unit: high pressure sensor and switch, low pressure switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
  - 9. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
  - 10. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
  - 11. The condensing unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
- B. Unit Cabinet:
  - 1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Fan:
  - 1. The condensing unit shall consist of propeller type, direct-drive fan motor(s) that have multiple speed operation via a DC (digitally commutating) inverter.
  - 2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type.

3. The fan shall be a vertical discharge configuration.
  4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
  5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
  6. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature.
- D. Condenser Coil:
1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
  2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
  3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
  4. The fins shall be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
  5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
- E. Compressor:
1. The inverter scroll compressors shall be variable speed (PVM inverter) controlled and capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
  2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G2-type" with a maximum speed of 7,980 rpm.
  3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
  4. The capacity control range shall be as low as 4% to 100%.
  5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
  6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
  7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
  8. The compressor shall be spring mounted to avoid the transmission of vibration.
  9. In the event of compressor failure in a system with multiple compressors, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
  10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.
- F. Electrical:
1. Refer to equipment schedules located on drawings for power requirements.
  2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.

3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
  4. The control wiring lengths shall be as shown below.
- G. Operating Range:
1. The operating range in cooling shall be 23°F DB ~ 122°F DB.
  2. The operating range in heating shall be 0°F DB - 77°F DB / -4°F WB - 60°F WB.

#### 2.03 4-WAY CEILING CASSETTE INDOOR UNITS (2'X2')

- A. General: The indoor unit shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grill. Unit to be connected to outdoor unit heat pump or heat recovery model. It shall be a four-way air distribution type, white, impact resistant with a washable decoration panel. The supply air shall be distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to control superheat for temperature control. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. The unit shall be suitable for installation in a 24 inch x 24 inch ceiling grid.
- B. Performance: Refer to equipment schedule on drawings.
- C. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
  2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
  3. Both refrigerant lines shall be insulated from the outdoor unit.
  4. The 4-way supply air flow shall be adjustable to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
  5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
  6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 21" of lift and have a built in safety shutoff and alarm.
  7. The indoor units shall be equipped with a return air thermistor.
  8. All electrical components shall be accessed through the decoration panel.
  9. The indoor unit shall be separately powered. Refer to equipment schedule on drawings for electrical requirements.
- D. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
  2. The unit shall consist of multiple auto-swing positions.
  3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
  4. Fresh air intake shall be possible by way of direct duct installation to the side of the indoor unit cabinet.
  5. A branch duct knockout shall exist for branch ducting supply air.
  6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:

1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
  2. The airflow rate shall be available in high and low settings.
  3. The fan motor shall be thermally protected.
- F. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
- G. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  3. The coil shall be a 2-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
  4. The refrigerant connections shall be flare connections.
  5. A condensate pan shall be located under the coil.
  6. A condensate pump shall be located below the coil in the condensate pan with a built in safety alarm.
  7. A thermistor will be located on the liquid and gas line.
- H. Electrical:
1. A separate power supply shall be required. Refer to equipment schedule on drawings for power requirements.
  2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- I. Control:
1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
  2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to schedule on drawings for options selected.

#### 2.04 CONCEALED CEILING DUCTED INDOOR UNITS (MEDIUM STATIC)

- A. General: The indoor unit shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It shall be constructed of a galvanized steel casing. Unit to be connected to outdoor unit heat pump or heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. Computerized PID control shall be used to control superheat for temperature control. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening.
- B. Performance: Refer to equipment schedule on drawings.
- C. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit shall be factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function,

- 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning for adjustment of airflow.
2. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
  3. Both refrigerant lines shall be insulated from the outdoor unit.
  4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 18-3/8" of lift from the center of the drain outlet and have a built in safety shutoff and alarm.
  5. The indoor units shall be equipped with a return air thermistor.
  6. The indoor unit shall be separately powered. Refer to equipment schedule on drawings for power requirements.
- D. Unit Cabinet:
1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
  2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
  2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.
  3. The airflow rate shall be available in three settings.
  4. The fan motor shall be thermally protected.
  5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
- F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
  4. The refrigerant connections shall be flare connections.
  5. A condensate pan shall be located under the coil.
  6. A condensate pump shall be located below the coil in the condensate pan with a built in safety alarm.
  7. A thermistor will be located on the liquid and gas line.
- G. Electrical:
1. A separate power supply will be required. Refer to equipment schedule on drawings for power requirements.
  2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
  2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to equipment schedule on drawings for options selected.

2.05 SLIM DUCT CONCEALED CEILING INDOOR UNITS

- A. General: The indoor unit model shall be a Slim, built-in ceiling concealed fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity. The unit shall be constructed of a galvanized steel casing. Unit to be connected to outdoor unit heat pump or heat recovery model. It shall be a horizontal discharge air with horizontal return air or bottom return air configuration. Computerized PID control shall be used to control superheat for temperature control. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. Included as standard equipment, a long-life filter that is mold resistant and a condensate drain pan and drain pump kit.
- B. Performance: Refer to equipment schedule on drawings.
- C. Indoor Unit:
  - 1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have adjustable external static pressure capabilities.
  - 2. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
  - 3. Both refrigerant lines shall be insulated from the outdoor unit.
  - 4. Return air shall be through a resin net mold resistant filter.
  - 5. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 23-5/8" of lift from the center of the drain outlet and have a built in safety shutoff and alarm.
  - 6. The indoor units shall be equipped with a return air thermistor.
  - 7. The indoor unit shall be separately powered. Refer to equipment schedule on drawings for power requirements.
  - 8. Switch box shall be reached from the side or bottom for service and maintenance.
- D. Unit Cabinet:
  - 1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
  - 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
  - 1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
  - 2. The airflow rate shall be available in high and low settings.
  - 3. The fan motor shall be thermally protected.
  - 4. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
  - 5. Fan motor external static pressure range for nominal airflow:
- F. Filter:
  - 1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
- G. Coil:
  - 1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  3. The coil shall be a 2 or 3-row cross fin copper evaporator coil with 14 FPI design completely factory tested.
  4. The refrigerant connections shall be flare connections.
  5. A condensate pan shall be located under the coil.
  6. A condensate pump with a 23-5/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
  7. A thermistor will be located on the liquid and gas line.
- H. Electrical:
1. A separate power supply shall be required. Refer to equipment schedule on drawings for power requirements.
  2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- I. Control:
1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
  2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to equipment schedule on drawings for options selected.

## 2.06 CEILING SUSPENDED CASSETTE INDOOR UNITS

- A. General: The indoor unit shall be a ceiling suspended fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall or ceiling within a conditioned space. Unit shall have a finished white casing. Unit to be connected to outdoor unit heat pump and heat recovery model. Computerized PID control shall be used to control superheat for temperature control. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment.
- B. Performance: Refer to equipment schedule on drawings.
- C. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from the rear, top or left and right sides of the unit.
  2. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
  3. Both refrigerant lines shall be insulated from the outdoor unit.
  4. Return air shall be through a resin net mold resistant filter.
  5. The indoor units shall be equipped with a condensate pan.
  6. The indoor units shall be equipped with a return air thermistor.
  7. The indoor unit shall be separately powered. Refer to equipment schedule on drawings for power requirements.

- D. Unit Cabinet:
  - 1. The cabinet shall be affixed to a factory supplied wall/ceiling hanging brackets and located in the conditioned space.
  - 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
  - 1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.
  - 2. The airflow rate shall be available in high and low settings.
  - 3. The fan motor shall be thermally protected.
- F. Coil:
  - 1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  - 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  - 3. The coil shall be a 2-row cross fin copper evaporator coil with 15 fpi design completely factory tested.
  - 4. The refrigerant connections shall be flare connections.
  - 5. A thermistor will be located on the liquid and gas line.
  - 6. A condensate pan shall be located in the unit.
- G. Electrical:
  - 1. A separate power supply shall be required. Refer to equipment schedule on drawings for power requirements.
  - 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  - 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
  - 1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
  - 2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to equipment schedule on drawings for options selected.
  - 3. The unit shall be compatible with a Daikin intelligent Touch advanced multi-zone controller or an intelligent Manager III customizable BMS. Consult with Daikin prior to applying controls.

## 2.07 FLOOR CONSOLE CONCEALED INDOOR UNITS

- A. General: The indoor unit shall be a floor or wall mounted console fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation within a conditioned space. It shall have a top discharge air grill and filtered bottom return air. The unit shall have an unfinished casing. Unit to be connected to outdoor unit heat pump or heat recovery model. The cabinets can be mounted on the floor with refrigerant and condensate lines directed downward or affixed to the wall with horizontal refrigerant and condensate knockouts. Computerized PID control shall be used to control superheat for temperature control. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mold-resistant, resin net air filter shall be included as standard equipment.
- B. Performance: Refer to equipment schedule on drawings.



C. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops.
2. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through a resin net mold resistant filter.
5. Condensate draining shall be made via gravity or external condensate pump.
6. The indoor units shall be equipped with a return air thermistor.
7. The indoor unit shall be separately powered. Refer to equipment schedule for power requirements.

D. Unit Cabinet:

1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
2. The cabinet shall be constructed with sound absorbing fiberglass urethane foam insulation.

E. Fan:

1. The fan shall be a direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The airflow rate shall be available in high and low settings.
3. The fan motor shall be thermally protected.

F. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

G. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3-row cross fin copper evaporator coil with 17 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections.
5. A thermistor will be located on the liquid and gas line.

H. Electrical:

1. A separate power supply shall be required. Refer to equipment schedule on drawings for power requirements.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

I. Control:

1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to equipment schedule on drawings for options selected.

## 2.08 OUTSIDE AIR PROCESSING UNITS

- A. General: The indoor unit shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. The unit shall be capable of introducing up to 100% outside air controlled to a fixed discharge air temperature. It shall be constructed of a galvanized steel casing. Unit to be connected to outdoor unit model heat pump and heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat for temperature control.
- B. Performance: Refer to equipment schedule on drawings.
- C. Indoor Unit:
  - 1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay and test run switch.
  - 2. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
  - 3. Both refrigerant lines shall be insulated from the outdoor unit.
  - 4. The indoor units shall be equipped with a discharge air thermistor.
  - 5. The indoor unit shall be separately powered. Refer to equipment schedule on drawings for power requirements.
- D. Unit Cabinet:
  - 1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
  - 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
  - 1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
  - 2. The fan motor shall be thermally protected.
  - 3. Fan motor external static pressure for nominal airflow:
- F. Coil:
  - 1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  - 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  - 3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
  - 4. The refrigerant connections shall be flare connections.
  - 5. A thermistor will be located on the liquid and gas line.
- G. Electrical:
  - 1. A separate power supply shall be required. Refer to equipment schedule on drawings for power requirements.
  - 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  - 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to equipment schedule on drawings for options selected.

2.09 REFRIGERANT PIPING

- A. The system shall be capable of refrigerant piping up to 540 actual feet or 620 equivalent feet from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280 feet of piping between the condensing and indoor units with 295 feet maximum vertical difference, without any oil traps.
- B. Piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

2.10 APPROVED MANUFACTURERS

- A. LG
- B. MITSUBISHI/TRANE
- C. DAIKIN

PART 3 - EXECUTION

3.01 GENERAL

- A. Install all equipment, piping, and controls in accordance with manufacturer's installation instructions.
- B. Install refrigerant piping as per manufacturer's instructions and specification.
- C. Mount the outdoor condensing unit on a concrete equipment pad or equipment support rails.
- D. Support the indoor unit as per the manufacturer's instructions.
- E. Mount the controller. Coordinate exact location with the owner.
- F. Install the drain line. Pitch drain line in the direction of flow.
- G. Install new filter on indoor unit.
- H. Clean all equipment after installation.

**END OF SECTION 238126.12**

## PART 1 - GENERAL

## 1.01 RELATED SPECIFICATIONS

- A. Section 232000 - Pipes, Valves and Fittings
- B. Section 233813 - Kitchen Hood Systems

## 1.02 SUBMITTALS

- A. Shop Drawings: Certified shop drawings for all coils not furnished as part of factory prefabricated unitized mechanical equipment.
- B. Product Data: Submit manufacturer's catalog sheets, performance charts, test data, standard schematic drawings, specifications and installation instructions for each coil.
- C. Quality Control Submittals:
  - 1. Certificates: Prior to the approval of coils, the Director may at his option, require certified copies of coil performance and data sheets for all coils.

## 1.03 QUALITY ASSURANCE

- A. Heating coils and cooling coils shall meet the applicable fabrication and testing requirements of the Safety Code for Mechanical Refrigeration ASHRAE 15. Ratings of coils, with the exception of the direct expansion refrigerant type, shall be in accordance with ARI Standard 410, "Forced Circulation Air Cooling and Air Heating Coils" And bear the ARI symbol. Coils exceeding the scope of the manufacturer's certification and/or the range of ari's standard rating conditions will be considered provided the manufacturer is a current member of the ARI air-cooling and air-heating coils certification program and the coils have been rated in accordance to ARI standard 410.
- B. Published coil data, complete with sizing information, shall be available for all coils submitted for approval.
- C. Manufacturer must be ISO 9002 certified.

## PART 2 - PRODUCTS

## 2.01 APPROVED MANUFACTURERS

- A. Modine
- B. Carrier
- C. Greenheck

## 2.02 FLUID COIL DESIGN PRESSURES AND TEMPERATURES

- A. Coils shall be designed to withstand 250 psi maximum operating pressures and a maximum fluid temperature of 300°F for standard duty copper tube coils. Optional high pressure construction will include cupronickel tubes and headers to increase maximum operating pressure to 350 psi and maximum operating temperature to 450°F. For cleanable coils with removable heads, coils shall be designed to withstand 100 psi maximum operating pressures and a maximum fluid temperature of 150°F. Higher limits are available, depending on coil construction and/or materials used.

- B. For High Pressure/Normal temperature fluid coils, the following Schedule should be used:
1. 0-150 psi: Standard Construction-5/8" x 0.020" copper tubing, 0.065" wall copper headers, copper end caps, vent and drain located as required, coil tubes extended into the header.
  2. 150-300 psi: 5/8" x 0.025 copper tubing, 0.095" copper headers, Monel end caps, vent and drain located on the face (locating on end caps is not allowed), 5/8" x 0.049" adapter tube construction
  3. 300-400 psi: 5/8" x 0.035" copper tubing, 0.187" wall brass pipe headers, Monel end caps, vent and drain located on the face (located on end caps not allowed), 5/8" x 0.049" adapter tube construction

## 2.03 FACTORY TESTING REQUIREMENTS

- A. Coils shall be submerged in water and tested with a minimum of 315 psi air pressure for standard copper tube coils and 125 psi for cleanable coils with removable heads. A 500 psig hydrostatic and shock test is required for high pressure cupronickel construction. Coils must display a tag with the inspector's identification as proof of testing.

## 2.04 FINS

- A. Coils shall be of plate fin type construction providing uniform support for all coil tubes. Stainless steel fins shall be constructed of 304 & 316 stainless. Carbon steel fins shall be constructed of ASTM A109-83. Coils are to be manufactured with die-formed aluminum, copper, stainless steel or carbon steel fins with self-spacing collars which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified.
- B. Manufacturer must be capable of providing self-spacing die-formed fins 4 through 14 fins/inch with a tolerance of +/- 4%.

## 2.05 TUBING

- A. Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction shall use seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel tubes shall be ASTM A249. Carbon steel tubes shall be W&D / ASTM A214 & seamless A179. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale.
- B. Design permits in-tube water velocities up to 6 ft/s for the standard seamless copper tubing, and up to 8 ft/s for optional seamless alloy C70600 cupronickel tubing.
- C. Tubes are to be mechanically expanded to form an interference fit with the fin collars. Coil tube size and wall thickness' are 5/8"x0.020 and 1/2"x0.016 and 1"x.035 standard for copper, with other options available. Steel tubes are offered as 5/8"x0.035 or 0.049.

## 2.06 HEADERS

- A. Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High-pressure construction is to incorporate seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel will be constructed of 304L & 316L (ASTM-A240) Sch-5 or Sch-10. Carbon steel headers shall be constructed of Sch-10 (ASTM-A135A) or Sch-40 (ASTM A53A) pipe.
- B. Coil return headers are to be equipped with factory-installed 1/2" fpt air vent connection placed at the highest point available on face of the header.

- C. Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. all core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch.
- D. End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.

## 2.07 CONNECTIONS

- A. Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe as a minimum. Stainless steel will be 304L or 316L (ASTM-A240) Sch-40 or Sch

2.08 80. CARBON STEEL WILL BE A53A SCH-40, A106A SCH-40 OR SCH-80 OR A53B SCH-80 PIPE.

## 2.09 CLEANING

- A. All residual manufacturing oils and solid contaminants are removed internally and externally by completely submersing the coil in an environmentally and safety approved type degreasing solution, which is also chemically compatible with the coil material. This may vary for steel tube coils, depending on the application and/or customer specifications.

## 2.10 BRAZING

- A. Oxyfuel gas brazing, using fillet rod material of minimum 5% silver, is used for all non-ferrous tube joints to headers and connections. Depending on the application, ferrous to non-ferrous brazing material may contain upwards of 35% silver, or may be Tobin bronze.

## 2.11 WELDING

- A. Gas shielded arc welding is used for welded vessels constructed of stainless steel. Gas welding is used for welded vessels constructed of carbon steel.

## 2.12 CASING

- A. Coil casing and endplate shall be fabricated from Galvanized steel, as a standard construction, meeting ASTM and UL G90U requirements, Aluminum, 0.080" thick, optional, Copper, 0.063 " thick, optional, 16- or 14-gauge carbon steel or stainless steel, optional. double-flange casing shall be provided when coils are specified as vertical stacking.
- B. Standard coil intermediate tube sheets (center tube supports) shall be fabricated from the same gauge sheet stock and material as the end plates, and to the following schedule:

| FINNED LENGTH<br>(INCHES) | NUMBER OF TUBE<br>SHEETS |
|---------------------------|--------------------------|
| 6.00 – 48.00              | 0                        |
| 48.01 – 96.00             | 1                        |
| 96.01 – 144.00            | 2                        |
| 144.01 AND GREATER        | 4                        |

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Coils to be installed in accordance with manufacturer's instructions and any applicable piping codes.

**3.02 LEAD TIME**

- A. Standard lead-time for custom made retrofit fluid coils of standard construction with OEM circuiting shall be 11-15 working days, with reduced lead-time emergency shipment options of 10 working days and 5 working days from order placement date and based upon production approval.
- B. Standard lead-time for custom made fluid coils of manufacturer's own standard design and circuiting shall be 10 working days, with reduced lead-time emergency shipment options for 5 working days, 48-hours and 24-hours from order placement date.
- C. All coils shall be quoted and offered as FOB Factory, Full Freight Allowed to any and all destinations within the Continental United States.

**END OF SECTION 238216**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Fan Coils
  - 1. Direct-Driven Air Handling Units - 0.8 square feet to 3.2 square feet of coil face area.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.
- C. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
- D. AHRI 350- Standard for Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment.
- E. ANSI S12.32 - Precision methods for the determination of sound power levels of discrete-frequency and narrow-band noise sources in reverberation rooms.
- F. ASHRAE Standard 62-89R - Ventilation for acceptable indoor air quality.
- G. UL 181 - Factory Made Air Ducts and Connectors.

## 1.03 QUALITY ASSURANCE

- A. Unit designed and tested in compliance with AHRI 260.

## 1.04 SUBMITTALS

- A. Submit unit performance data including: capacity, nominal operating performance and electrical consumption.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements. Include safety and start-up instructions.

## 1.05 REGULATORY REQUIREMENTS

- A. Units must be UL listed as a Fan-Coil Unit and meet UL 883 - Fan-Coil Units Standard for Safety requirements, and UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
- B. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his expense provide for a field inspection by a UL/CUL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the Owner.
- C. Manufacturers must participate in the AHRI Certification program. Unit performance data must be rated in accordance with AHRI Standard 440, and must display the AHRI Symbol on all



standard units. If a manufacturer does not participate in the AHRI Certification program, specified equipment must be witnessed by the engineer to meet the criteria of the specification.

- D. Conform to UL1995 for internal wiring of factory-wired equipment.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Units shall ship fully assembled.
- C. Store in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- D. Deliver units to site with factory mounted piping package. If piping package is not factory installed, contractor shall be responsible for all expenses associated with installation, and leak testing the assembly.

#### 1.07 START-UP AND OPERATING REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, condensate properly trapped, piping connections verified and leak-tested, all shipping braces removed, and fan has been test run under observation.
- B. Include manufacturers' descriptive literature, operating instructions, installation instructions, maintenance and repair data, including filter replacement.

#### 1.08 WARRANTY

- A. The equipment purchaser shall be provided, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and have capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.
- B. Provide labor warranty for one year.

### PART 2 - PRODUCTS

#### 2.01 SUMMARY

- A. The contractor shall furnish and install units as shown and scheduled in the plans. The units shall be installed in accordance with this specification and produce the specified performance in accordance with AHRI Standard 550/590-98.
- B. Base bid shall be a Sterling unit with approved alternates being Trane, Carrier and York. Alternates must comply with the performance and features called for in this specification. Job awarded on basis of specified unit. Alternates will be considered after the job is awarded.
- C. Manufacturer must clearly define any exceptions made to Plans and Specifications. Any deviations in layout or arrangement shall be submitted to engineer prior to bid date for approval. Mechanical Contractor is responsible for expenses that occur due to exceptions made.

#### 2.02 GENERAL UNIT DESCRIPTION

- A. Coils

1. Evenly spaced aluminum fins mechanically bonded to 3/8 inch OD minimum copper tubes, designed for 300 psi and 200 degrees F.
  2. A changeover sensor shall be provided for operation of a coil for both hydronic cooling and hydronic heating.
- B. Chassis and Cabinet:
1. Concealed: construction shall be minimum 18 gauge for framing, top panels, and side panels with all rounded edges on exposed corners.
  2. Vertical Cabinet: construction shall be minimum 16 gauge for the front panel and 18 gauge for framing, top panels, and side panels with all rounded edges on exposed corners.
  3. Recessed / Horizontal Cabinet: construction shall be minimum 18 gauge for the front/top/bottom panels, side panels and framing with all rounded edges on exposed corners.
  4. Discharge Arrangements:
    - a. Vertical concealed units shall have front toe space inlet and top duct collar outlet.
    - b. Vertical cabinet units shall have front bar grille inlet and top quad grille outlet.
    - c. Horizontal cabinet units shall have bottom stamped louver inlet and front bar grille outlet.
    - d. Horizontal recessed units shall have bottom stamped louver inlet.
    - e. Vertical recessed units shall have front stamped louver inlet and front stamped louver outlet.
  5. Vertical cabinet units shall have leveling feet.
  6. Cabinet and recessed units shall have a minimum of 14-inches available for the piping end pocket of the unit.
  7. Cabinet and recessed units shall key-operated locking access doors.
  8. Vertical cabinet units shall have 2" to 7" sub-bases constructed of 18 gauge steel and painted the same finish as the base of the unit.
  9. Vertical cabinet units shall have a 2" to 8" false back constructed of minimum 18 gauge steel and painted the same finish as the unit.
  10. Cabinet units shall have a recessing flange constructed of 18 gauge steel and painted the same finish as the unit.
- C. Cabinet Insulation:
1. Acceptable cabinet insulation shall include:
    - a. Closed cell insulation or foil-faced insulation shall be the only acceptable material for insulating in accordance with ASHRAE 62-89R. Matted or fiber-glass insulation of any type is not acceptable.
    - b. Insulation shall meet UL rating 94-5v for fire hazard classification which satisfies flame and smoke safety requirements.
    - c. The exposed side shall be high density erosion proof material suitable for use in airstreams up to 4500 FPM.
- D. Finish: Factory applied baked powder coat on visible surfaces of cabinet. Non-lead based paint must be used. To maintain a better long term appearance all bases, top control doors and grilles shall be black.
- E. Fans: Centrifugal forward-curved double-width, double-inlet corrosion resistant wheels, statically and dynamically balanced, direct driven. Fans shall be constructed of metal with metal housing for long-term high reliability and shall be in the blow through configuration.
- F. Motor: All motors shall be Brushless DC (BLDC)/Electronically Commutated Motors (ECM) factory programmed and run tested in assembled units.
1. The motor controller shall be mounted in a touch-safe control box with a built in integrated user interface and LED tachometer.

2. If adjustments are needed, changes to the motor parameters shall be made through the use of momentary contact switches accessible on the motor control board and adjustable without the need for factory service personnel.
  3. Motors shall have a soft ramp between speed changes to minimize the acoustical impact due to speed changes.
  4. Motors shall be operated at three speeds or with a field supplied variable speed controller. The motor will choose the highest will choose the highest speed, if there are simultaneous/conflicting speed requests.
  5. All motors shall have integral thermal overload protection with a maximum ambient operating temperature of 104F and shall be permanently lubricated.
  6. Motors shall be capable of starting at 50 percent of rated voltage and operated at 90 percent of rated voltage on all speed settings.
  7. Motors shall operate up to 10 percent over-voltage.
- G. Fan Speed Control: wall mounted or unit mounted fan speed controller will provide an interface to factory wiring, including variable speed/High-Medium-Low (HML) control. The control box will contain a line voltage to 24-volt transformer and ECM motor controller.
1. A unit mounted fan speed switch will be factory wired and electrically tested.
  2. The fan speed switch shall open a factory-installed outside air damper when a fan speed is selected, and close the outside damper when the fan speed switch is in the OFF position.
- H. Valve cycling control: The fan shall run continuously at the selected speed setting and the control valve shall cycle automatically to satisfy setpoint temperature setting. The unit controls shall be controlled by 24 volt relays and a factory-wired transformer.
- I. Controller Interface: An interface shall be provided to interface to a third party controller.
1. The control box contains:
    - a. Relay board
    - b. Line voltage to 24-volt transformer
    - c. Quiet contactors (for electric heat)
  2. All end devices shall be wired to a low voltage terminal block and run tested.
  3. When normally open valves are selected, inverting relays shall be provided for use with standard thermostats.
- J. DDC Control: The Application Specific Controller (ASC) shall allow the control valve or staged electric heat and 3-speed fan to work cooperatively to meet precise capacity requirements, while minimizing fan speed and valve position. The ASC shall be computer-commissioned and tested before shipping from the unit factory. The controller shall be used as a stand-alone application or with a compatible building automation system. The application specific controller shall be factory mounted by the unit manufacturer and shall meet the following "Standard - Open" LonMark Protocol:
1. Unit Mounted Controller Standard Interoperability
    - a. Unit Fan Coil Controllers shall reside on the LonTalk FTT-10a network, and provide data using LonMark standard network variable types and configuration properties.
    - b. Unit Fan-Coil Controllers shall support the LonMark Space Comfort Controller functional profile. The terminal unit controller supplier shall provide a list confirming their support for all mandatory data, and identify which optional network variables and configuration properties they support. Any vendor-defined network variables or configuration properties shall be described via an XIF file supplied with the product.
- K. Filter: Easily removable 1-inch, located before the coil.
- L. Tamperproof Locks: Fan coil units shall be provided with key operated locks on control access door. Filter section shall be removable without front panel removal.

## 2.03 APPROVED MANUFACTURERS:

- A. Modine
- B. Sterling
- C. Trane
- D. Approved Equal

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as specified.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

## 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install fan coil units as indicated. Coordinate to assure correct recess size for recessed units.
- C. Protect units with protective covers during balance of construction.
- D. Contractor is responsible for providing hydronic units with shut-off valve on supply and lockshield balancing valve on return piping, as well as float operated automatic air vents with stop valve.
- E. Furnish copy of manufacturer's wiring diagram submittal. Verify that electrical wiring installation is in accordance with manufacturer's submittals and installation requirements of Division 26 sections.

## 3.03 CLEANING

- A. Clean work.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials available from manufacturer.
- D. Contractor shall clean the coil and remove, clean, and reinstall the drain pan prior to turnover of the project. A signed certificate or inspection by facility engineer is required prior to final contract payment is made.
- E. Install new filters.

**END OF SECTION 238219**

## PART 1 - GENERAL

## 1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 232000: Pipe, Valves, and Fittings.

## 1.02 SUBMITTALS

- A. Product Data:
  - 1. Manufacturer's catalog sheets, brochures, performance charts, standard finish chart, specifications and installation instructions for each item specified.
  - 2. Schedule: Itemize pipe or tube size and material, fin size and material, fin thickness, fin spacing per linear foot, actual finned length of each element, number of rows of element and rating in Btuh per linear foot of finned element (single or double row) and location of installation (room or space number).

## 1.03 PRODUCT DELIVERY

- A. Deliver equipment in original shipping containers, properly labeled as to type, size and finish.

## 1.04 MAINTENANCE

- A. Special Tools: One tool for each type and size vandal resistant fastener.

## PART 2 - PRODUCTS

## 2.01 - HOT WATER CONVECTORS

- A. Cover Assembly
  - 1. Furnish and install 350 Series model 351-14 baseboard cover assembly as manufactured by Slant/Fin Corp., consisting of one-piece, back and top panel, and one-piece front panel, formed of cold rolled steel. Bottom and top edges of back panel shall be formed to provide channels along entire length, to receive full-height support brackets. Brackets shall be die-formed of electro galvanized cold rolled steel, for rigid bracing and spring locking. Slide-action expansion cradles, formed of polypropylene, shall be inserted between heating element and support bracket. Cradles shall protect element bottom and sides from contact with brackets or cover, confining element to free lateral expansion for noiseless operation. All cover components with a 19-gauge front cover shall be painted in Nu-White thermosetting polyester enamel and all cover components with a 16-gauge front cover shall have a galvanized finish.
- B. H-1 Element
  - 1. Furnish and install H-1 baseboard heating element as manufactured by Slant/Fin Corp. consisting of 3/4" nominal copper tubing, with 3" x 3-1/4" x .024" aluminum fins, spaced 48 per linear foot. The tubing shall not be weakened by expansion in process of manufacture, but shall be forced through undersized fin holes to obtain a force-fit mechanical bond. A flange with four teeth shall be formed on each fin to increase thermal contact and to space and lock the fins uniformly in place. One end of each element tube shall be expanded to receive the unexpanded end of another, without couplings.

## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. Install the Work of this Section in accordance with the manufacturer's printed instructions unless otherwise shown or specified.

- B. Secure convector radiator enclosures to masonry wall construction with expansion shields and bolts, of size in number and on centers as recommended by the manufacturer.
- C. Install convector with air vents, isolation valves, and a balancing valve.
- D. Install access panels for each control, shutoff, and balancing valve installed in enclosure.

**END OF SECTION 238236**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Electric Wall Heaters.

## 1.02 REFERENCES

- A. Electric unit heaters shall meet the requirements of the National Electric Code (NEC) and shall be UL listed.

## 1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Submit manufacturer's product data and installation instructions to Engineer.
- C. Submittal data shall include capacity and size of each heater and wiring instructions.

## PART 2 - PRODUCTS

## 2.01 ELECTRIC WALL HEATERS

- A. Electric unit heater shall be Model AWF1501T as manufactured by Stelpro or approved equal. The heaters shall be UL listed and be designed for wall, recess, or surface mounting. Refer to equipment schedule for mounting type.
- B. Heater Assembly: The heater assembly shall consist of a fan panel upon which is mounted all of the operational parts of the heater.
- C. Heating Element: The heating element shall be of non-glowing design consisting of an 50/20 nickel chromium resistance wire enclosed in a steel sheath to which plate fins are copper brazed. It shall be warranted for 5 years.
- D. Fan and Fan Motor: The fan shall be five-bladed aluminum. The fan motor shall be totally enclosed.
- E. Fan Delay Switch: Fan control shall be of bi-metallic, snap action type, and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after the thermostat is satisfied and until the heating element is cool.
- F. Thermostat: The tamper-proof thermostat shall be of the bi-metallic, snap-action type with enclosed contacts. It shall be completely concealed behind the front cover to become tamper proof.
- G. Thermal Cutout: A thermal cutout shall be built into the system to shut off the heater in the event of over-heating.
- H. Disconnect Switch: A double-pole single throw disconnect switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind the front grid panel.
- I. Back Box: The back box shall be designed for duty as a recessed rough-in box in either masonry or frame installations and for use with a surface mounting frame in surface mounting installations. The back box shall be 20-gauge galvanized steel and shall contain knockouts through which power leads are brought.

- J. Front Panel: The front panel shall be of the bar grille type and shall be constructed of 16 gauge cold rolled steel, welded into a uniform grille and finished in baked enamel to direct the warmed air toward the floor. The front grille shall be surrounded by a decorative satin-finish aluminum frame.
- K. Provide other accessories as described on the contract drawings.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install unit in accordance with manufacturer's published installation instructions.
- B. Do not install horizontal unit heaters closer than 12 inches to combustible materials in any direction.
- C. Do not install vertical unit heaters closer than 18 inches from ceiling and 24 inches horizontally from combustible materials in any direction. The bottom of the unit must be a minimum of 8 feet above the floor.

**END OF SECTION 238239**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Unit Heaters.

## 1.02 RELATED SECTIONS

- A. Section 232007 - Piping Specialties
- B. Section 232001 - Pipes, Valves and Fittings
- C. Section 230993 - Sequence of Operations
- D. Section 230594 - Balancing of Air and Hydronic Systems

## 1.03 SUBMITTALS

- A. Product Data
- B. Submit manufacturer's catalog sheets, brochures, performance charts, specifications and installation instructions.
- C. Maintenance Data
- D. Submit maintenance instructions and spare parts lists. Include this data, product data, shop drawings and schedule in maintenance manuals in accordance with Division 1.

## 1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
- B. Firms regularly engaged in manufacture of unit heaters, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Unit heaters shall be shipped from the factory in suitable protective covering. Store unit heaters and components in clean dry place. Protect from weather, fumes, water, construction debris, and physical damage.

## PART 2 - PRODUCTS

## 2.01 UNIT HEATER

- A. Unit heater shall consist of an enclosed, extended-surface heating element with propeller-type fan, with capacity and electrical characteristics as shown on the drawings. The entire unit and controls shall be UL-labeled. Heater shall be mounted with threaded rod, unless directed otherwise by manufacturer, and be suitable for mounting with horizontal air discharge.
- B. Hot Water Coil: Extended surface type, utilizing aluminum fins and DLP-type copper tubes with cast bronze supply and return connections. Coils shall be of serpentine design with horizontal tubes, vertical fins, and center supply and return connections. All tube bends shall be brazed. Tubes shall be mechanically bonded to the collars of the fins. Coils shall be capable of operating at hot water pressures and temperatures of 150 psig and 375 deg F.

- C. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard/motor mounting bracket; horizontal models with permanently lubricated sleeve bearings. Aluminum construction secured to a steel hub.
- D. Cabinet shall be minimum 20 gauge steel treated to prevent corrosion and painted with a corrosion resistant, high solids gray-green finish. Casing top shall be provided with threaded rod connections for hanger rods, except models to be directly mounted to the supply and return piping as suggested by the manufacturer. Provide horizontal and vertical louvers on the discharge for direction of the air.

## 2.02 CONTROLS

- A. Controls shall consist of a wall-mounted, line voltage thermostat, with protective cover and lock. See section 230993 for sequence of operation.

## 2.03 ACCESSORIES REQUIRED (PROPELLER TYPE)

- A. Accessories required are as follows:
  - 1. Thermostats as required. Some thermostats will control (multiple) unit heaters. Refer to the contract drawings for the required number of thermostats.
  - 2. Galvanized Support brackets.

## 2.04 ACCEPTABLE MANUFACTURERS

- A. Unit heater shall be the make and model number shown on the drawings or equivalent products by:
  - 1. Modine
  - 2. Sterling
  - 3. Trane
  - 4. Approved Equal

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install unit heaters using threaded rod, sized according to unit tappings. Secure to structural support as required.
- B. Install the unit heaters in the locations shown on the contract drawings.
- C. Make electrical connections for power and controls as required by code. Refer to the Sequence of Operation in Section 230993.
- D. Check the unit heater for proper operation, including safety controls.

## END OF SECTION 238239.12

## PART 1 - GENERAL

## 1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 232000: Pipe, Valves, and Fittings.

## 1.02 SUBMITTALS

- A. Product Data:
  - 1. Manufacturer's catalog sheets, brochures, performance charts, standard finish chart, specifications and installation instructions for each item specified.
  - 2. Schedule: Itemize burner section, length of each heater section, flue piping, and any other options.

## 1.03 PRODUCT DELIVERY

- A. Deliver equipment in original shipping containers, properly labeled as to type, size and finish.

## 1.04 MAINTENANCE

- A. Special Tools: Provide any special tools required for maintenance.

## PART 2 - PRODUCTS

## 2.01 - POSITIVE PRESSURE RADIANT HEATERS

- A. Provide model VPS gas-fired tubular radiant heaters. The heaters shall be model VPS/VPT, radiant tubular heating system with a power burner housed on a burner/control box firing into a 4" diameter combustion chamber tube. The burner/control box and tubular system shall be designed for horizontal suspension.
- B. Units shall be (80) MBH capacity, and shall be equipped for use with natural gas (supplied with propane conversion kit) with 115/1/60 supply voltage.
- C. Unit shall include a single-stage gas valve and a single-speed combustion fan. The burner control system shall have a 24-volt transformer; a multi-try direct spark ignition with soft lockout; single-stage combination gas valve; LED diagnostic light; power "ON" indicator light; a power burner with pre-purge and post purge; and a differential air pressure switch to monitor combustion air. Gas connection to the unit must be with approved flexible connector.
- D. The tubular system shall include Calcoat and rolled steel tubes. Tubes will be connected to each other with rolled steel couplings.
- E. System shall also include aluminized steel (400 series stainless steel) overlapping reflectors with reflector retainers, and end covers).
- F. The entire system will be suspended with aluminized steel suspension hangers, chain, and "S" hooks. System will be leveled by use of standard turnbuckle kits.
- G. Heater may be vented horizontally or vertically and may operate on inside combustion air. Reflectors may be positioned from horizontal to 55 degree angle.
- H. These units must be aproved for us in the United States and Canada. The manufacturer shall provide a 5-year limited warranty on the burner and all electrical and mechanical operating components and a 10-year limited warranty on the tubes, minimum.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the Work of this Section in accordance with the manufacturer's printed instructions unless otherwise shown or specified.
- B. Install access panels for each control, shutoff, and balancing valve installed in enclosure.

**END OF SECTION 238300**

## PART 1 - GENERAL

## 1.01 DESCRIPTION OF WORK

- A. Provide all labor, materials, and equipment as necessary to complete work as indicated on the Drawings and as specified herein. Section includes:
  - 1. Snow-Melting System Components
  - 2. Snow Melt Manifold Enclosures
  - 3. Snow Melt Slab Insulation

## 1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 079201 - Non-Fire Rated Sleeves and Seals
- C. Section 230529 - Pipe Hangers and Supports
- D. Section 230555 - Mechanical System Identification
- E. Section 230594 - Balancing of Air and Hydronic Systems
- F. Section 230700 - Pipe Insulation
- G. Section 232000 - Pipe, Valves, and Fittings
- H. Section 235216 - Fire Tube Condensing Boiler

## 1.03 REFERENCES

- A. ASHRAE Handbook - 2003 HVAC Applications, Snow Melting and Freeze Protection.

## 1.04 SYSTEM DESCRIPTION

- A. System shall be of hydronic type, field-assembled components including snow melt tubing and direct buried distribution piping. System shall consist of boiler, injection pump, zone circulation pumps, expansion tank, air separator, hydraulic separator, temperature and pressure gauges, balancing valves, valves and fittings, glycol feed unit, manifolds and fittings, direct buried supply mains (refer to drawings) distribution loops, and controls.

## 1.05 SNOW MELT SYSTEM DESIGN CRITERIA

- A. Snow Melt System design criteria/parameters:
  - 1. HWH Supply Temperature                      Max. 123.6°F
  - 2. Working Fluid                                      100% Water
  - 3. Heat Source - Boiler Plant                      228,627 BTU/Hr (Output)

## 1.06 EQUIPMENT AND SERVICES TO BE PROVIDED BY VENDOR

- A. Equipment:
  - 1. The Vendor shall design, supply, deliver, supervise installation (as described here-in), startup, balance and test the snow melt system, as rated and guaranteed in accordance with this Specification and as shown on the accompanying Drawings. The system shall consist of:

- a. Insulated zone distribution piping (direct buried). Above ground distribution piping to be provided by contract 'H' per section 230700 and 232000.
  - b. Manifolds with all fittings, valves, test-kit, etc. as required for a fully functioning system.
  - c. Snow melt tubing, un-coiler, tube cutter, tube installation tool, fixing wire, etc. as required to properly install tubing and piping per vendor specifications.
  - d. Slab and air temperature sensors, humidity sensors, snow/ice sensor.
- B. Services to be provided by the Vendor shall consist in general of the following:
1. Delivery of equipment specified.
  2. Preparation of shop drawings for equipment specified.
  3. Preparation of operations and maintenance manuals.
  4. Design, purchase, fabricate, assemble, and integrate components as described herein.
  5. Furnish and deliver ancillary components to the site for field installation.
  6. Startup of equipment and other items as indicated in this specification and attached drawings.
  7. Train Owner's personnel in equipment operation and maintenance.

#### 1.07 EQUIPMENT AND SERVICE BY OTHERS

- A. The following work shall be performed by other trades (part of project - work to be provided by GC). Vendor shall provide supervision, inspection of installed systems, and technical assistance.
1. Offloading of equipment
  2. Rigging, assembly and erection of equipment
  3. External power supply wiring to equipment (by electrical contractor)
  4. Snow melt manifold safety barrier (size requirements to be specified by snow melt system supplier)
  5. Building floor cutting, pipe sleeves and tubing conduits at slab and foundation wall penetrations.
  6. Site preparation (excavation, compacting of soil, rebar, concrete work, paving, etc.)
  7. Slab insulation, expansion joint sleeves, etc.
  8. Installation/construction of:
    - a. Installation of snow melt tubing
  9. Installation and wiring of field instrumentation and control valves (by controls contractor)
  10. Connection to facility controls, data/communications, security and fire alarms

#### 1.08 SUBMITTALS

- A. Shop Drawings for Snow Melt System: Include outdoor manifolds (and minimum dimensions for manifold vaults), PEX tubing, sensor socket and sensor, performance data, components and accessories, wiring diagrams, dimensions, weights and loadings, field connections, installation details for PEX tubing, and required clearances.
- B. Test Reports: Include operating test data submitted by the manufacturer's field service representative.
- C. Operation and Maintenance Data: Include approved selection data, start-up instructions, maintenance data, part lists, accessories, control and wiring diagrams, and test reports.
- D. Shop Drawings
1. Where deviations from the Drawings and Specifications are proposed for any reason, submit shop drawings identifying proposed deviations showing layout of all piping, fittings, materials, dimensions, and fabrication and installation details. Submit a comparison table

of the specified features and ratings of the specified item and those of the proposed deviation to allow a direct comparison.

2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility. No dimensional or coordination check will be made.
3. The Contractor has the sole responsibility to review the Drawings, coordinate piping fabrication, and provide clearances and access for installation, maintenance and balancing of this Work, and Work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the piping.
4. Submit all layout shop drawings on not less than ¼ inch equals 1 foot scale drawings.

#### 1.09 START-UP AND OPERATING REQUIREMENTS

- A. Do not operate system for any purpose, temporary or permanent, until piping connections have been verified, piping has been flushed, cleaned and pressure tested.

#### 1.10 QUALITY ASSURANCE

- A. Codes and Standards
  1. MMC 2003
  2. ASHRAE 90.1
  3. ASTM F876, "Standard Specification for Crosslinked Polyethylene (PEX) Tubing".

#### 1.11 WARRANTY

- A. Manufacturer shall furnish, at the completion of installation, as described herein, a Certificate of Inspection signed by his authorized representative. The minimum five (5) year system warranty shall be provided to the Owner by the Contractor.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers of snow melt systems are:
  1. Wirsbo / Uponor
  2. Heat Link
  3. Snow Technology, Inc.

#### 2.02 PIPES, TUBING AND FITTINGS

- A. Underground distribution loop shall be cross-linked polyethylene, PEX-A with an oxygen diffusion barrier, rated at minimum 180 deg. F. and 100 psi working pressure, conform to ASTM standards F876/F877, and marked "SNOW MELT SYSTEM". Minimum tubing size is 5/8" nominal ID. Tubing shall have a minimum bend radius of not more than six times the tubing OD at 68 degree F. Tubing shall be UV stabilized. Approved Manufacturer: UPONOR he PEX plus, or approved equal.
  1. Tubing shall carry a twenty-five (25) year warranty. Warranty to be included with submittals.
- B. Underground piping mains shall be pre-insulated PEX pipe. System shall consist of PEX pipe with an oxygen diffusion barrier, CFC free PEX closed cell foam insulation, and a corrugated twin wall HDPE protective sheath. Provide brass PEX compression x MPT adapters as necessary. Installer shall provide additional brass fittings as necessary for a complete system. Approved Manufacturer: ECOFLEX TWIN THERMAL pre-insulated pipe with jacket, or approved equal.

- C. Mains above ground shall be Type L copper. See Section 232000 "Pipes, Valves, and Fittings"
- D. Distribution manifolds shall be constructed of copper, or approved equal. Provide isolation ball valves and thermometers in both the supply and return. Manifolds shall be compatible with tubing and shall have end caps tapped for manual air vents and a drain valve. Provide mini ball valves with PEX compression fittings for each loop for isolation and balancing. Installer shall provide a ball valve and circuit balancing valve with full shutoff capability for each manifold set.

### 2.03 MISCELLANEOUS EQUIPMENT/INSTRUMENTS/DEVICES

- A. A. Provide all ancillary components shown on drawings, flow diagrams or as necessary for a complete, fully functioning system, including balancing valves, isolation valves, multi-purpose (isolation & balancing) valves, pressure gauges, temperature gauges, temperature sensors, etc.

### 2.04 CONTROLS

- A. Provide a central control panel with touch screen user interface, housing all controllers as required to control and interlock boiler, pumps, and zone controls for a completely automatic functioning system. Control panel shall be provided with a lockable disconnect switch in a wall mountable (minimum NEMA 12) enclosure. All field wiring for instrumentation or control shall be wired to this panel for all system inputs and control outputs. Control panel shall require a single 120VAC power feeder. All step-down transformers/power supplies shall be included in the control panel for all field devices. Pump motors and boilers shall have separate individual power feeders and noted on equipment schedules.
- B. Control shall include slab sensors, snow/ice sensor, outdoor temperature sensor, supply and return glycol temperature sensors, overheat protection, and control valves as required. System shall be turned on and off automatically. An HOA switch shall be provided for each zone in order to select each zone to operate in 'Auto' mode, 'Hand' mode (manually enabled) or 'Off' (manually disabled).
- C. Snow/ice melting control shall regulate the rate at which heat is transferred into a snow melting slab, and determine the required supply glycol temperature from measurement of the slab temperature. Modulation of the heat delivery shall be accomplished by the heat injection pump. Snow/ice detector shall activate the snow/ice melting control upon the detection of snow/ice formation on the snow melting slab.
- D. Microprocessor-based snow/ice melting controller shall be provided that:
  - 1. Will indicate a general fault via a flashing red light at the main snow melt panel.
  - 2. Has built-in hardware interface capable to communicate via BAC-Net protocol meeting the latest ISO 16484-5 standard for future remote monitoring and basic control (on/off/override) of the snow melt system main controls. Programming and communication cabling will be performed at a future date. Only the physical communications interface hardware is required at this time.
- E. Preliminary Control Sequence Minimum Requirements. The controller shall be capable of the following control sequences/parameters. All parameters shall be user adjustable with appropriate password protection. All parameters shall be programmable at the local control panel. The noted parameters / status items shall be available for remote control/monitoring upon installation of future BACnet communications.
  - 1. Slab Protection (Delta T Max) - maximum temperature at cold start.
  - 2. Viscosity Compensation (Alt. Temp. Delta T Max) - Max temperature overshoot during warm up.
  - 3. Run Time - time delay for system shut down once slab temperature setpoint is achieved.
  - 4. Warm weather shut down temperature.



5. Cold weather cut out - shuts down the system in extremely cold temperatures.
6. Start-up idle temperature
7. Slab target temperature
8. Additional melt timer
9. Purge timer
10. Precipitation sensor calibration
11. Auto / Manual / Local / Remote Enable (local and remote capable)

F. Control Manufacturer: TACO iWORX, GREEN-LINK, or approved equal.

## 2.05 SLAB INSULATION

- A. A. Insulation shall be provided below the snow melt slab areas to provide thermal insulation between the heated slab and the sub-grade, sub-soil, aggregate base course, etc.
- B. B. Provide Extruded Polystyrene Insulation board, installed per manufacturer's instructions as follows:
  1. Standard Duty Concrete Sidewalks: ASTM C578 Type VI, 40 PSI min. compressive strength.
  2. Heavy Duty Concrete Pavement: ASTM C578 Type V, 100 PSI min. compressive strength.
- C. C. Insulation shall be Owens Corning FOAMULAR, DOW Styrofoam, or approved equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Slab Preparation and Snow Melt System
  1. A complete snow melt system including tubing loop, manifolds, fittings, and sensors shall be installed in accordance with the manufacturers' recommendations. The Contractor shall follow the Shop Drawings for tube layout, tube spacing, and manifold and sensor locations.
  2. Stamp "Snow Melt System" all along the edge of the heated surface. Review layout with Project Representative prior to stamping.
  3. Distribution manifolds, attached to supply and return mains, shall be located inside a yard box adjacent to the heated slab section, as shown on drawings.
  4. A minimum of one supply and one return manifold is required for each zone as shown on drawings. Locate main piping under the walk as much as possible. Main piping located outside the walk shall be at least 36" below ground, and shall be protected by indicator warning tape. Provide flow balance for entire system.
  5. Reinforcing steel (6 x 6 - W1.4 x W1.4 minimum) shall be furnished by the Contractor and supported as required over entire heated area. All areas where snow melt system is to be installed shall have the required preparation including grading, compaction and under-slab insulation completely installed.
  6. 5/8"- inch pipe circuits shall be attached to reinforcing steel on 9" centers using 12 inch minimum return bends without fittings. All circuits shall be approximately 100 feet in length and form a continuous conduit without joints from supply to return manifolds. Maximum loop length shall not exceed 300 ft. All loops shall be of similar length with no more than +/- 10% variation from average loop length.
  7. Pipe circuits shall be embedded in concrete at specified depth. All pipe connections, fittings and distribution manifolds shall be free of concrete and arranged so as to be easily serviced by removal of access box cover.
  8. Distribution loop shall be pressure tested with water or air in accordance with the manufacturer's recommendations prior to concrete cover. The system shall remain at this

pressure during the concrete installation and for a minimum of 24 hours thereafter to insure system integrity.

9. Outdoor sensor shall be installed on the north or west wall with shield.
10. Connections
  - a. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
  - b. Install piping adjacent to machine to allow service and maintenance.
  - c. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.
  - d. Install electrical connections for power, controls, and devices.

### 3.02 FIELD QUALITY CONTROL

- A. Manufacturer shall provide inspection service and technical assistance for the installation:
  1. Site preparation
  2. Testing
  3. Start-up and balance
  4. Annual maintenance shall be available for inspection, adjustment and lubrication of system equipment.

**END OF SECTION 238318**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Excavation and backfill for electrical work.
- B. Primary power wiring and distribution system.
- C. Secondary power wiring and distribution system.
- D. Lighting, including lamps.
- E. Wiring devices.
- F. Electrical control systems and interlock wiring.
- G. Wiring for built-in equipment.
- H. Distribution panels and switches.
- I. Engine generator system and automatic transfer switch.

## 1.02 RELATED WORK

- A. Foundations and pads required for equipment furnished under this division of specifications.
- B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.
- C. Flashing and sealing of conduits through outside walls.
- D. Cutting and patching for electrical work, except for errors and omissions under this Division.

## 1.03 QUALITY ASSURANCE

- A. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.
- B. Electrical equipment provided under this Division shall be turned over in operating condition. Instruction on further operation and maintenance shall be included in the operating and maintenance instructions.

## 1.04 REFERENCES

- A. Perform work in accordance with standards listed below. Where these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Engineer.
  - 1. NFPA-70: National Electrical Code
  - 2. NFPA-101: Life Safety Code
  - 3. New York State Energy Code
  - 4. New York State Building Code
  - 5. Applicable New York State Administrative Code
  - 6. Applicable Town Ordinances.
  - 7. Electric utility rules and regulations.
  - 8. Telephone utility rules and regulations.

### 1.05 PERMITS AND FEES

- A. The Contractor shall obtain and pay for all permits, construction charges, fees, licenses, certificates, inspections and other use charges required in connection with the work.
- B. Such permits include, but are not limited to:
  - 1. Transportation and disposal of debris.
  - 2. Temporary Electrical Services and Permanent Electrical Service.
  - 3. Telephone Service.
  - 4. Electrical Inspectors, Inc., or a pre-approved electrical inspection agency.
  - 5. Road opening permits.

## PART 2 - PRODUCTS

### 2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment used in carrying out these specifications shall have UL listing and label. Specifications and drawings indicate name, type, or catalog numbers of materials and equipment to be used as standards. Proposals shall be based on these standards. Contractor may use materials and equipment equivalent to those specified, subject to Engineer's approval.

## PART 3 - EXECUTION

### 3.01 COORDINATION

- A. Carefully examine specifications, drawings and project site to be thoroughly familiar with items which require electrical connections and coordination. Electrical drawings are diagrammatic and shall not be scaled for exact sizes.
- B. Notify other Contractors of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to the Owner. Engineer to be mediating authority in all disputes arising on project.
- C. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a clarification shall be requested of the Engineer for decision before preceding with such work.
- D. Insofar as it is possible to determine in advance, advise masonry tradesmen to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should the Contractor neglect doing this, any cutting and/or patching required to be done is at this Contractor's expense.

### 3.02 CUTTING AND PATCHING

- A. Repair or replace routine damage caused by cutting in performance of work under this Division.
- B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.
- C. Holes cut through floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs to be properly sealed, fire proofed and waterproofed.

- D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

### 3.03 TESTS

- A. On completion of work, installation shall be completely operational and entirely free from ground, short circuits, and open circuits. Perform a thorough operational test in presence of the Engineer. Balance all circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.
- B. Furnish Engineer with a copy of such tests including identification of each circuit and readings recorded, also the main service ground resistance test as described in Section 260526 of these specifications. Test information to include ampere readings of all panels and major circuit breakers, isolation resistance reading of motors and transformers.

### 3.04 IDENTIFICATION OF EQUIPMENT

- A. Properly identify the following:
  - 1. Distribution panels.
  - 2. Disconnect switches.
  - 3. Transfer switches.
  - 4. Individually mounted circuit breakers.
  - 5. Relays.
  - 6. Pilot lights and control switches.
  - 7. Service entrance equipment and main circuit breaker.
- B. Use permanently attached black phenolic plates with 1/4-inch white engraved lettering on the face of each, attached with two sheet metal screws.
- C. Panelboard identification plates shall indicate panel by name.

### 3.05 INSTALLATION

- A. The Contractor shall carefully move and replace existing equipment, appliances and all related items, as required to conduct proposed work.
- B. Install and conduct all work per applicable NEC, State and local codes.

**END OF SECTION 260000**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Wires and cables.
- B. In general, the wires and cables included under this Section shall include, but not be limited to, the following:
  - 1. 600V power and control cable
  - 2. Communication cables
- C. All conductors to be continuous from origin to panel or equipment termination without splices.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NECA Standard of Installations.

## 1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.

## 1.04 QUALITY ASSURANCE

- A. Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the General Conditions.
- B. Contractor shall submit the following information pertaining to the manufacturer(s):
  - 1. Complete literature, performance, and technical data describing the proposed equipment and listing of items made by the manufacturer.
  - 2. Location of closest service office from which this equipment shall be serviced.
  - 3. Location of closest parts inventory for item installation.

## 1.05 COORDINATION

- A. Coordination:
  - 1. Coordinate wire and cable required with the equipment being furnished by others for the satisfactory operation of the equipment or system.
  - 2. Review installation procedures under other sections and contracts and coordinate them with the work specified herein.
  - 3. Notify other prime contractors in advance of the installation of the work included to provide them with sufficient time for installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the work included in this Section.

## 1.06 PROJECT CONDITIONS

- A. Verify that embedded conduit, in masonry and concrete, is installed as shown on the Drawings prior to the work being enclosed by others.
- B. The Contractor shall be present at all concrete pours made by the General Contractor.
- C. Conductor sizes are based on copper at 75°C.

- D. Wire and cable routing shown on Drawings is approximate unless dimensioned or specifically called for such as where conduit is to be embedded in concrete or masonry. Route wire and cable as required to meet project conditions and shall be routed above ceilings, directly under joists, in pipe trenches, where available, and in masonry. Where exposed conduit is permitted, it shall be run to maximize wall space.
- E. Field verify destination location to determine cable routing.
- F. Where wire and cable routing is not shown for proposed destination, determine exact routing and lengths required. Routing shall be reviewed with the Engineer.

## PART 2 - PRODUCTS

### 2.01 CONDUCTORS

- A. Install products in accordance with manufacturer's recommendations.
- B. Single copper conductors with 600-volt insulation.
- C. Minimum size of feeder conductors and grounds shall be No. 12 AWG.
- D. Insulation: No. 12 AWG and No. 10 AWG, provide ANSI/NFPA 70, Type THWN-2.
- E. Use solid conductor for feeder and branch circuits, 10 AWG and smaller.
- F. All conductors shall include complete set of manufacturer's markings for insulation and conductor size.
- G. Manufacturers shall be ANACONDA, TRIANGLE, ROME, or approved equal.
- H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

### 2.02 4-PAIR CATEGORY 6 UNSHIELDED TWISTED PAIR CABLE

- A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
  - 1. Belden Corporation, Carmel, IN (800) 246-2673.
  - 2. Avaya, Basking Ridge, NJ (800) 344-02232.
  - 3. Berk-Tek, Incorporated, New Holland, PA (800) 237-5835.
  - 4. CommScope, Hickory, NC (800) 982-1708.
  - 5. Draka Comteq, Franklin, MA (888) 541-7100.
  - 6. General Cable, Highland Heights, KY (800) 424-5666.
  - 7. Mohawk/CDT Leominster, MA (978) 537 9961.
  - 8. NORDX/CDT, Worcester, MA (800) 331-0779.
  - 9. Superior Essex, Atlanta, GA. (800) 685-4887.
  - 10. Tyco Electronics, Harrisburg, PA (800) 522-6752.
- B. Conductors: 4 twisted pair - 24 AWG, solid copper w/ RJ-45 connector ends
  - 1. Individually insulated plenum rated conductors under common plenum rated sheath unless entire cable is installed within conduit/EMT or if area where cable is installed is not considered a return air plenum according to any applicable codes.
  - 2. Complies with individual characteristics established in ANSI/TIA/EIA-568-B, and all addendums for Category 6 cable performance specification.
  - 3. Overall Nominal Diameter: .365 x .165 in.

4. Nominal Impedance: 100 ohms plus or minus 15 percent.
  5. Certified capable of performing to minimum 350 MHz.
- C. Mechanical Characteristics
1. Operating temperature: -20°C to +80°C
  2. Bulk cable weight: 29 lbs./1000 ft.
  3. Maximum recommended pulling tension: 45 lbs.
  4. Minimum bend radius: 1 in.
- D. Flame test: UL1666 Riser
- E. Electrical Characteristics:
1. Nom. Mutual Capacitance @ 1 KHz 15.0 pF/ft
  2. Maximum Capacitance Unbalance (pF/100 m) 49.2 pF/100 m
  3. Nominal Velocity of Propagation 70 %
  4. Maximum Delay (ns/100 m) 510 @ 100MHz ns/100 m
  5. Maximum Delay Skew (ns/100m) 25 ns/100 m
  6. Maximum Conductor DC Resistance @ 20 Deg. C 9 Ohms/100 m
  7. Maximum DCR Unbalance @ 20 Deg. C 3 %
  8. Max. Operating Voltage - UL 300 V RMS

### 2.03 MECHANICAL CONNECTORS

- A. Conductor tapping connectors shall be BURNDY Servit split bolt, Series KS and KS3, or approved equal.
- B. Split bolt connectors shall use BURNDY Type SC Servit cover on indoor applications.
- C. Terminal lugs shall be BURNDY Universal Terminal Series. Terminal lugs shall be sized for proper ampacity and proper number of conductor holes. Each conductor shall occupy only one hole on a terminal lug.
- D. Conductor tapping connectors for multiple conductors shall be BURNDY Series V-Tap with V-Tap covers, and V-Blok mounting platforms.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. General:
1. Make terminations in accordance with cable manufacturers instructions for the particular type of wire and cable.
  2. Splices are not allowed in the underground duct and manhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing.
  3. All splices shall be in made in terminal boxes.
- B. Wire and Cable Sizes: The sizes of wire and cable shall be as shown on the Contract Drawings, or if not shown, as approved by the Engineer. Minimum size wire shall be No. 12 AWG for all power, lighting and receptacle circuits. Wires for control circuits shall be No. 14 AWG minimum. Wire for instrumentation circuits shall not be smaller than No. 16 AWG. If due to field routing the voltage drop exceeds 2.5%, the size of conductors shall be increased such that 2.5% is the maximum voltage drop incurred.
- C. Number of Wires: The number of wires indicated on the Contract Drawings for the various control, indications, and metering circuits were determined for general schemes of control and



for particular indication and metering systems. Coordinate wiring schemes with equipment schematics.

- D. **Wiring Identification:** All wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers. Where no wire numbers are indicated, the Contractor shall assign wire numbers. Wire numbers shall not be duplicated.
- E. **Cable Identification Tags:** The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a laminated plastic tag, bearing clearly printed, the cable number indicated on the Contract Drawings or some other approved identification number or symbol. All cables shall be temporarily tagged with its full ID number immediately after it has been pulled.
- F. **Wiring Supplies:** Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used. Friction tape shall be in accordance with ASTM D69.
- G. **Training of Cable:** Furnish all labor and material required to train cables around cable vaults within buildings and in manholes in any outdoor underground duct system. Sufficient length of cable shall be provided in each manhole and vault so that the cable can be trained and racked in an approved manner. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fireproofed.
- H. **Connections at Control Panels, Limit Switches and Similar Devices:**
  - 1. Where stranded wires are terminated at panels, and/or devices connections shall be made by solderless lug, crimp type ferrule or solder dipped.
  - 2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size and shall install No. 14 AWG stranded wires to the junction box in a conduit.
- I. **Pulling Temperature:** Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage with an ambient temperature not lower than 55 degrees F and pulling shall be completed during the work day for which the cable is removed from the protected storage.
- J. **Color Coding:**
  - 1. Conductor jacket shall be color coded as follows:

**AC POWER**

| <b>480V/277 Volt<br/>3 phase</b> |  | <b>208Y/120 Volt<br/>3 phase<br/>(NEC)</b> |  |  |
|----------------------------------|--|--------------------------------------------|--|--|
| Phase A<br>Brown                 |  | Phase A<br>Black                           |  |  |
| Phase B<br>Orange                |  | Phase B<br>Red                             |  |  |
| Phase C<br>Yellow                |  | Phase C<br>Blue                            |  |  |

|                                  |  |                                            |  |  |
|----------------------------------|--|--------------------------------------------|--|--|
| <b>480V/277 Volt<br/>3 phase</b> |  | <b>208Y/120 Volt<br/>3 phase<br/>(NEC)</b> |  |  |
| Neutral<br>White                 |  | Neutral<br>White                           |  |  |
| Ground<br>Green                  |  | Ground<br>Green                            |  |  |

2. Equipment Ground - GREEN

3.02 IDENTIFICATION

- A. Identify wire and cable under provisions of Section 260553.
- B. Identify each conductor with its circuit number.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Field Testing:
  - 1. Wires and cables shall be tested before being connected to motors, devices or terminal blocks.
  - 2. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.
  - 3. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.
- E. Continuity Tests: All cables, wires and shields shall be tested for continuity. Testing for continuity shall be by test light or buzzer.
- F. Insulation-Resistance Tests:
  - 1. 600V power and control cables and wires shall be tested for their insulation-resistance values. Test shall utilize a megohmmeter with applied voltage to be 1000VDC for one (1) minute. Insulation-resistance test shall be performed on each conductor with all other conductors grounded. The resistance value shall be 20 megohms or greater.

**END OF SECTION 260519**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.

## 1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

## PART 2 - PRODUCTS

## 2.01 COMPONENTS

- A. Ground clamps: OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG", or equal by STEEL CITY or APPLETON.
- B. Raceways, conductors, outlet boxes, pull and junction boxes to be furnished in accordance with applicable sections of these specifications.
- C. Rod Electrode: Copper, 3/4-inch diameter, 10 feet long.
- D. Wire: Copper, sized to meet NFPA 70 requirements.

## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. General:
  - 1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
  - 2. Effectively bond all grounding conductors to grounding rod electrodes, equipment enclosures and ground busses.
  - 3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
  - 4. Install service entrance building ground as per NEC and Local Utility requirements.
  - 5. Service entrance shall be bonded to street side of first flange or coupling of incoming main water line with heavy duty ground clamp. Bonding conductor to be sized in accordance with NFPA 70.
  - 6. Building steel shall be bonded to ground bus on main service with a conductor the same size as in B.1 below.
  - 7. Install new service grounds and grounding systems for new service as per Local Utility and NEC requirements.
  - 8. Generators shall have a dedicated grounding system for a separately derived system for switching neutrals.

## B. Feeder/Branch Circuits:

1. All circuits shall have a separate green grounding conductor in conduit sized in accordance with NFPA 70. Minimum size of conductor shall be No. 12 AWG.
2. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit to have a jumper wire sized to ampacity of branch breaker and to be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

## 3.02 TEST

- A. Test ground on main service. Ground system resistance shall be no greater than 10 ohms using test equipment similar to a "Biddle" test. Test data to be submitted to the Engineer for approval and such approved test data to become a part of the Record Documents.

**END OF SECTION 260526**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. System of supporting devices and hangers for support or bracing for conduit, electrical equipment, safety switches, fixtures, panelboards, outlet boxes, junction boxes and cabinets.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.

## 1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

## PART 2 - PRODUCTS

## 2.01 EQUIPMENT REQUIREMENTS

- A. Provide appropriate corrosion-resistant supporting devices and hangers for electrical equipment, as manufactured by ERICO PRODUCTS, INC., CADDY FASTENERS, STEEL CITY, MINERALLAC or equivalent.
  - 1. "Z" purlin clips.
  - 2. Conduit clips.
  - 3. Beam clamps (universal and vertical flange).
  - 4. Beam clamps (set screw type).
  - 5. Combination push-in conduit clips.
  - 6. Combination conduit hanger clamps.
  - 7. Flexible conduit clips.
  - 8. Special combination conduit clips.
  - 9. One hole steel straps.
  - 10. Conduit hangers.
- B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment, wire in conduit and conduit.

## 2.02 CHANNEL SUPPORT SYSTEM

- A. Channel systems and supports shall be manufactured by KINDORF/THOMAS & BETTS, or approved equal.
- B. Channels shall be 1-1/2" x 1-1/2".
- C. Channels and all associated accessories and bolts shall be hot dipped galvanized.
- D. Channels shall have 9/16" bolt holes on 1-1/2" centers.
- E. Provide end caps for all channels.

## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed 10 feet in accordance with currently effective edition of the National Electric Code.
- B. In seismic zones, support conduits 1 inch and smaller at 6 foot intervals.
- C. Install clamps secured to structure for feeder and other conduits routed against structure. Use drop rods and hangers to support conduits run apart from the structure.
- D. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, etc.
- E. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. Prepainted or galvanized support material is not required to be painted or repainted.
- F. Do not use chains, perforated iron, baling wire or tie wire for supporting conduit runs. Use of clips to support conduit to top of t-bar ceiling grid will not be permit-ted.
- G. Obtain permission from Engineer before drilling or cutting structural members.
- H. Install surface mounted cabinets and panelboards with a minimum of four anchors.
- I. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.
- J. Install products in accordance with manufacturer's instructions.

**END OF SECTION 260529**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Conduit system with associated couplings, connectors and fittings. Conduits to be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
  - 1. Conduit Use - Rigid Galvanized Conduit:
    - a. All exterior circuits above ground.
    - b. All circuits concealed in CMU walls.
  - 2. Conduit Use - PVC Sch. 80
    - a. Secondary service power feeds from Central Hudson transformers only.
    - b. All exterior circuits below ground.
  - 3. Conduit Use - Electrical Metallic Tubing (EMT) Conduit:
    - a. All interior circuits above ground.
  - 4. Conduit Use - Metal Clad (MC) Cable:
    - a. All 15 and 20 amp branch circuits concealed in walls or ceilings.
  - 5. Conduit Use - Flexible Liquid-tight Metal Conduit:
    - a. Connecting motors, generators and other equipment subject to vibration, maximum length - 3 feet.
    - b. Passing through building expansion joints.
  - 6. Surface mounted raceway (Wiremold)
    - a. For use in finished areas on block walls and plaster walls, only.
  - 7. J-Hooks
    - a. For use above finished ceilings for telephone, PA, CAT 6 data and fire alarm cable only.
- B. Device Boxes: Provide each fixture switch, receptacle and other wiring device with a box of appropriate size and depth for its particular location use unless indicated otherwise.
- C. Pull boxes, junction boxes and wire troughs

## 1.02 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI/NFPA 70 - National Electric Code.
- C. NECA Standard of Installation.
- D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. NEMA TC 3 - PVC Fittings for use with Rigid PVC conduit and tubing.
- F. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- G. ANSI/NEMA OS1 - Sheet-steel outlet boxes, device boxes, covers and box supports.
- H. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

## 1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Working Drawings:

1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
2. Manufacturer's catalog cuts for the conduit, boxes, fittings and supports proposed for use.
3. Construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed by a licensed Engineer.
4. Scaled working drawings showing proposed routing of all conduits, inclusive of conduits routed above grade on exterior support structures, embedded in structural concrete and conduits directly buried in earth. Drawings shall show locations of pull and junction boxes and all penetrations in walls and floor slabs.

#### 1.04 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc.
- B. Conform to requirements of ANSI/NFPA 70.

#### 1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record actual routing of all conduits.

#### 1.06 FIELD SAMPLES

- A. Provide under provisions of Section 014500.
- B. Provide field sample of conduit two each at 2 feet in length.
- C. Provide field sample of expansion/deflection fitting, two each.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products in accordance with manufacturers' recommendations.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing abovegrade. Provide appropriate covering.

#### 1.08 PROJECT CONDITIONS

- A. Verify all conduit routings by field measurements.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Provide all required sweeps, boxes and fittings.

### PART 2 - PRODUCTS

#### 2.01 RIGID GALVANIZED CONDUIT

- A. Rigid conduit shall be hot dipped, galvanized, or electro-galvanized steel by Wheatland, Triangle, Republic or approved equal.



- B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.
- C. ERICKSON couplings, Series 676 or approved equal, shall be used where neither length of conduit can be rotated.
- D. Conduit connectors shall be threaded type. Set screw and compression type connections ARE NOT acceptable.
- E. Sealing fitting locknuts shall be Series 142SL.
- F. Steel or malleable iron insulated bullet hub, Series 370-379, complete with sealing "O" ring. DO NOT use "die cast" material.
- G. Entrance ells shall be Series 1491 or approved equal.
- H. Combination coupling shall be Series 531 for connecting rigid galvanized conduit to electrical metallic tubing.

#### 2.02 PVC CONDUIT

- A. PVC conduit shall be manufactured by WHEATLAND, TRIANGLE REPUBLIC or approved equal.
- B. Description: NEMA TC 2; Schedule 80 PVC.
- C. Fittings and Conduit Bodies: NEMA TC3.

#### 2.03 ELECTRICAL METALLIC TUBING (EMT)

- A. Electrical metallic tubing shall be WHEATLAND, TRIANGLE, REPUBLIC, or approved equal.
- B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR, or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.
- C. EMT connectors shall be TC-2125C compression type with threaded locknut. Set screw connectors will not be acceptable.
- D. EMT couplings shall be TK-2125C compression type. Set screw connectors will not be acceptable.

#### 2.04 METAL CLAD CABLE (MC)

- A. Metal clad cable shall be manufactured by BICCGENERAL or approved equal.
- B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal.
- C. Conductors shall be types THHN and THWN. Ground wire shall be sized as per NEC with green THHN/THWN insulation. All conductors shall be cabled and wrapped in polyester tape. All conductors shall be rated for 600 VAC.

- D. Armor material shall be Aluminum Interlocked Armor.

#### 2.05 SURFACE MOUNTED RACEWAY (WIREMOLD)

- A. Manufacturer: Wire Mold shall be manufactured by LEGRAND or approved equal.
- B. Model: 700 Series - One-Piece Steel Surface Raceway.
- C. Paint wire mold to match existing wall color.
- D. UL5 and ADA compliant.
- E. UL and cUL Listed.

#### 2.06 HAZARDOUS LOCATION SEALING HUB

- A. Hazardous location sealing hubs shall be O-Z/GEDNEY EYH, EYH-SG or approved equal.
- B. Contractor shall provide hazardous sealing fittings of different types and configurations to facilitate the installation as manufactured by O-Z/GEDNEY or approved equal.
- C. Sealing compound and fiber shall be O-Z/GEDNEY type EYC and EYF.

#### 2.07 DUCT SEAL

- A. RectorSeal or approved equal.
- B. Model #: 81881

#### 2.08 J-HOOKS

- A. TO BE USED ABOVE FINISHED CEILING ONLY. FOR TELEPHONE, PA, CAT 6 DATA AND FIRE ALARM CABLE ONLY. ALL EXPOSED TELEPHONE, PA, CAT 6 DATA AND FIRE ALARM CABLE SHALL BE IN CONDUIT.
- B. Erico Caddy HP J. Hook Series or approved equal.
- C. Provide wire retainers for all.
- D. Provide mounting hardware and accessories as required.
- E. Spacing of J-Hooks and supports shall not exceed 5'-0" on center.

#### 2.09 FLEXIBLE LIQUID-TIGHT METAL CONDUITS AND FITTINGS

- A. Liquid-tight flexible metal conduit shall be ANACONDA or approved equal.
- B. Description: Interlocked steel construction with PVC jacket.
- C. Provide flexible liquid-tight conduits and fittings as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO. or approved equal. Catalog numbers used below are those of the THOMAS & BETTS CORP., based on 3/4" size and are to be considered as standards by which equivalents are to be judged. All conduit shall be liquid-tight flexible type, UL type UA, or suitable for exposure to continuous or intermittent moisture.
- D. Flexible liquid-tight connectors shall be Series 5333 or approved equal.

## 2.10 OUTLET AND DEVICE BOXES

- A. Acceptable Manufacturers: Raco, General Electric or approved equal.
- B. Sheet Metal Outlet Boxes - All concealed boxes shall be NEMA OSI, galvanized steel:
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Provide 1/2" male fixture stubs where required.
- C. Concrete Ceiling Boxes: Concrete type.
- D. Cast Boxes: All exposed surface mounted boxes shall be NEMA FB1, Type FD, cast fer alloy. Provide gasketed cover by box manufacturer.

## 2.11 PULL BOXES

- A. All pull boxes used for this project shall be minimum B-3-6 or specifically approved equal for all customer installed power and control circuits.
- B. Provide H-20 Cast-Iron Traffic Load Cover. Cover shall have 3" high logo "Electric".

## 2.12 JUNCTION BOXES

- A. Acceptable Manufacturers: RACO, GENERAL ELECTRIC or approved equal.
- B. Sheet metal boxes: NEMA OS1, galvanized steel.
- C. Covers: Galvanized steel.

## 2.13 WIRE TROUGH

- A. Wireways shall be manufactured by Square D, Class 526, rain tight trough or approved equal.
- B. Wireway shall be completely enclosed with removable covers.
- C. Construction: 16 Gauge Galvanized Steel. 8-inch and 12-inch wire trough shall be 14-gauge galvanized steel.
- D. Finish: ANSI-49 epoxy paint applied by cathodic electro-deposition paint process over a corrosion resistant phosphate preparation.
- E. UL listed.

## 2.14 EXTERIOR WIRE TROUGH

- A. Wireways shall be manufactured by SQUARE D, Class 526, rain tight.
- B. Wireway shall be completely enclosed with removable covers.
- C. Construction: Wireway shall be constructed of Type 304 stainless and shall have stainless steel screw clamps, and oil resistant gaskets.
- D. All hardware, bolts, brackets, and supports shall be constructed of Type 304 stainless steel.

## 2.15 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT THREAD COMPOUND

- A. KOPR-SHIELD or approved equal.

## PART 3 - EXECUTION

## 3.01 INSTALLATION OF CONDUITS

- A. Minimum size of conduits shall be 3/4-inch.
- B. Minimum conduit depth shall be 24" below grade, measured to the top of the conduit on exterior underground installations.
- C. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.
- D. All threaded conduits and fittings shall have KOPR-SHIELD compound applied to all threads prior to assembly.
- E. Make bends or offsets with standard ells or field bends with an approved bender.
- F. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.
- G. Secure conduits to all boxes and cabinets with double locknuts and bushings so system will be electrically continuous from service to all outlets.
- H. Install conduit in accordance with NECA Standard of Installation.
- I. Cap ends of conduits to prevent entrance of water and other foreign material during construction.
- J. Complete all conduit systems before pulling conductors.
- K. Support conduits under provisions of Section 260529.
- L. Provide approved expansion joints or fittings and bonding jumpers where conduits in concrete pass through building expansion joints.
- M. Provide cable supports in conduits rising vertically in accordance with the National Electric Code, Article 300-19.
- N. Provide No. 12 AWG copper pull wires or nylon cord in all empty conduits. Steel wire not acceptable as pull wire.
- O. Install conduit to preserve fire resistance rating of partitions and other elements.
- P. Ground and bond conduit under provisions of Section 260526.
- Q. Where neither length of conduit can be rotated, ERICKSON couplings Series 676 shall be used.
- R. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated bullet hub, complete with recessed sealing "O" ring, shall be used, Series 370-379 . DO NOT use die cast material.
- S. In concrete slabs block up conduit from forms and securely fasten in place. All conduits in slabs shall be installed below concrete slab.

- T. Where conduits running overhead pass through building expansion joints, install flexible liquid tight conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3-inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.
- U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.
- V. Arrange supports to prevent misalignment during wiring installation.
- W. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- X. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- Y. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- Z. Do not attach conduit to ceiling support wires.
- AA. Arrange conduit to maintain headroom and present neat appearance.
- AB. Route exposed conduit parallel and perpendicular to walls.
- AC. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- AD. Route conduit in and under slab from point-to-point.
- AE. Do not cross conduits in slab.
- AF. Maintain adequate clearance between conduit and piping.
- AG. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104°F (40°C).
- AH. Bring conduit to shoulder of fittings; fasten securely.
- AI. Use conduit hubs with sealing locknuts to fasten conduit in damp and wet locations.
- AJ. Install no more than equivalent of three 90-degree bends on interior locations between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
- AK. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- AL. Do not use dissimilar strap or clamp supports. Provide dielectric tape, fittings, straps, and bushings where dissimilar metals are used.
- AM. Where fittings for liquid-tight flexible conduit are brought into an enclosure with a knockout, a gasket assembly, consisting of one piece "O" ring, with a Buna-R sealing material, Series 5200, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

- AN. A copper ground wire sized in accordance with NEC shall be installed on the inside of the conduit as a jumper around flexible conduit to assure a continuity of ground.
- AO. Install a copper jumper across all flexible conduit including lighting fixtures, controls and other utilization equipment.
- AP. Install liquid-tight flexible conduit in such a manner as to prevent liquids from running on surface toward fittings.
- AQ. Allow sufficient slack conduit to reduce the effect of vibration.
- AR. Complete all conduit systems before pulling the conductors.
- AS. Support in accordance with requirements of National Electric Code.

### 3.02 INSTALLATION OF BOXES

- A. Install boxes concealed in finished walls.
- B. Locate boxes to prevent moisture from entering or accumulating within them.
- C. Support boxes independently of conduit, as required by the National Electric Code.
- D. Provide 4" x 1-1/2" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square ceiling outlet boxes.
- E. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.
- F. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed concealed in concrete block walls. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gang-type outlet boxes only in drywall construction.
- G. Provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets. Single gang device boxes are not acceptable.
- H. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.
- I. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.
- J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.
- K. Effectively close unused openings in boxes with metal plugs or plates.
- L. Set boxes so that front edges are flush with finished surfaces.
- M. Support boxes from structural members with approved braces.

- N. Install blank device plates on outlet boxes left for future use.
- O. Provide bushings in holes through which cords or conductors pass.
- P. Install boxes so that the covers will be accessible at all times.
- Q. Electrical boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. All clearance between such boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than 16 square inches so as not to interfere with the wall rating.

### 3.03 INSTALLATION OF PULL BOXES, JUNCTION BOXES AND WIRE TROUGHS

- A. Provide junction boxes as shown on Drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8-inches deep. Provide screw covers for junction boxes.
- B. Install boxes in conduit runs wherever necessary to avoid long runs or too many bends. Do not exceed 100-foot runs without pull boxes. Install pull boxes at all 90-degree bends.
- C. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.
- D. Install boxes with covers in accessible locations. Size boxes in accordance with the National Electric Code.
- E. Do not install pull boxes or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.
- F. Coordinate installation of exterior pull boxes with General contractor to establish elevations of finished grades and pavements. All castings shall have chimney adjustment of + 6".

### 3.04 CONDUIT LOCATIONS

- A. Route all conduit concealed in walls or above finished ceilings. Provide boxes and conduits concealed in walls for all power and controls.
- B. Surface mounted conduits will only be allowed in utility rooms, and storage rooms. Surface mounted conduits shall only be permitted for vertical runs. All horizontal runs shall be installed above finished ceilings.
- C. Surface mounted raceway (wiremold) conduit will only be allowed on finished block walls or on plaster walls, where conduit cannot be run concealed. All horizontal runs shall be installed above finished ceilings, where drop ceilings are located.
- D. All conduit and wiremold shall be primed and painted to match existing adjacent wall color.
- E. J-Hooks are only permitted to be used above finished ceilings for telephone, PA, CAT 6 data and fire alarm cable.

**END OF SECTION 260533**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

## 1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide catalog data for nameplates, labels and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation and installation of product.

## 1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

## PART 2 - PRODUCTS

## 2.01 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
- B. Locations:
  - 1. Distribution panelboards.
  - 2. All control switches and pilot light devices.
  - 3. Transfer Switches.
  - 4. Generator Enclosure.
- C. Letter Size:
  - 1. Use 1/4 inch (6 mm) letters for identifying all control pilot lights.
- D. Labels: Embossed adhesive tape, with 3/16" (5mm) white letters on black background. Use for identifying existing equipment, distribution panels, switchboards, disconnect switches, and individual electrical devices.

## 2.02 WIRE MARKERS

- A. Manufacturers:
  - 1. 3M ELECTRICAL SPECIALTY DIV., Product Scotch Code.
  - 2. THOMAS & BETTS CORP., Product E-Z Code.
  - 3. Substitutions shall be permitted only after receiving written approval from the Engineer.



- B. Description: Epoxy film tape type wire markers.
- C. Locations: Each conductor at panelboards, auxiliary gutters, pull boxes, outlet and junction boxes, circuit breakers and each load connection.
- D. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
  - 2. Control Circuits: Control wire number indicated on interconnection diagrams on drawings.

### 2.03 CONDUIT MARKERS

- A. Manufacturers:
  - 1. THOMAS & BETTS CORP.
  - 2. Substitutions shall be permitted only after receiving written approval from the Engineer.
- B. Description: Self-sticking vinyl; black letters on orange background.
- C. Location: Furnish markers for each conduit longer than 6 feet (1.8 m).
- D. Spacing: 20 feet (6 m) on center.

### 2.04 UNDERGROUND WARNING TAPE

- A. Manufacturers:
  - 1. THOMAS & BETTS CORP., Model NAF-0700.
  - 2. Substitutions shall be permitted only after receiving written approval from the Engineer.
- B. Description: 6 inch (150 mm) wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

### 3.02 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws, rivets or adhesive.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Apply conduit markers at 20 foot (6 m) intervals.
- E. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade.

### 3.03 ELECTRICAL EQUIPMENT IDENTIFICATION

- A. The Contractor shall identify all existing circuits in existing distribution panels, switchboards and disconnect switches to remain.
- B. Label all circuits identifying the load served including all individual circuit breakers.

- C. Label all new circuit breakers and switches used for new feeder and branch circuits.
- D. Contractor shall furnish a minimum of 5 custom engrave three-layer laminated plastic labels with up to 20 words per label as directed by the engineer/owner in addition to the required labels for all pilot devices, switches, controls and timers.

**END OF SECTION 260553**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Surge protection device.

## 1.02 RELATED SECTIONS

- A. Section 012500 - Substitution Procedures.

## 1.03 STANDARDS

- A. The specified suppressor shall be designed, manufactured, tested and installed in compliance with:
  - 1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41 and C62.45).
  - 2. Federal Information Processing Standards Publication 94 (FIP PUB 94).
  - 3. National Electrical Manufacturer Association (NEMA LS-1).
  - 4. National Fire Protection Association (NFPA 20, 70, 75 and 78).
  - 5. Underwriters Laboratories (UL 1449).
  - 6. CAN/C22.2 No. 8-M1986; CSA Electrical Certification Notice No. 516.
  - 7. The system individual units shall be UL listed under UL 1449 Standard for Transient Voltage Surge Suppressions (TVSS) and the surge ratings shall be permanently affixed to the TVSS.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. MCG ELECTRONICS, INC., Deer Park, New York.
- B. Approved equal.

## 2.02 MANUFACTURED UNITS

- A. Surge suppression shall be series Surge Free Model No. 200LS.

## 2.03 SYSTEM REQUIREMENTS

- A. The specified surge protective device shall provide effective high energy surge diversion for application ANSI/IEEE C62.41-1991 Location Category C3 environments. Testing per ANSI/IEEE C62.45-1992 using ANSI/IEEE C62.41 Category C3 waveforms and amplitudes. UL 1449 listing. The specified surge protective device shall provide:
  - 1. 200,000 transient amps, per phase of surge protection.
  - 2. Peak surge current ratings must be independently tested and verified.
  - 3. All mode protection, L-N, L-G, L-L, N-G.
  - 4. Integral disconnect with safety dead front.
  - 5. Each MOV protected from over-current, thermal overload and monitored individually.
  - 6. Self diagnostics with comprehensive LED bar graph on front panel showing the exact % level of protection available.
  - 7. Audible fault alarm with silence switch.
  - 8. Event counter, indication of time and date of last event (battery backup for time and date).
  - 9. Remote alarm relay contacts (surge protected), Form C.
  - 10. Micro-Z low impedance installation cable.
  - 11. Twenty year warranty on entire system.

12. LIFETIME "NO NONSENSE" WARRANTY ON FIELD REPLACEABLE POWER MODULES AND FUSES.

B. Environmental Requirements:

1. Magnetic Fields: Connection shall be made using low impedance Micro-Z cabling provided with the suppressor for maximum magnetic field cancellation. Unit shall be shunt-installed with no series connected elements.
2. Operating Temperature: Operating temperature range shall be -40° to +71° C (-40° to +160° F).
3. Storage Temperature: Storage temperature range shall be -40° to +85° C.
4. Relative Humidity: Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.
5. Operating Altitude: The system shall be capable of operation up to an altitude of 13,000 feet above sea level.
6. Operating Voltage: Maximum continuous operating voltage shall be no less than 115% and no greater than 140% of the nominal rated line voltage.
7. Power Frequency: The power frequency range shall be 47 to 440 Hertz.

C. Electrical Requirements:

1. Unit Operating Voltage Requirements:

| <b>Voltage:</b>                          | <b>Description:</b>      | <b>Joules<br/>(8/20us):</b> | <b>Vpeak L-N<br/>(20kV, 10kA):</b> | <b>Vpeak L-N<br/>(6kV, 3kA):</b> |
|------------------------------------------|--------------------------|-----------------------------|------------------------------------|----------------------------------|
| <b>120/208V</b><br>Insert voltage<br>VAC | 3phase, 4W +<br>gnd, wye | 13,248                      | 644V                               | 900V                             |

2. Unit shall be installed in parallel with the protected equipment. No series connected protective elements shall be used.
3. The maximum surge current capacity per phase of the specified system, based on the standard IEEE 8/20 microsecond waveform, shall be at least: 1 Event at 200 kA. The surge life (8/20us) shall be at least 10,000 @ 10 kA occurrences. The transient suppression capability shall be bi-directional and suppress both positive and negative impulses.
4. The suppressor shall be capable of interrupting a 100 kAIC, short circuit current delivered from the AC power line. The interrupt capability must be confirmed and documented by a recognized independent testing laboratory.
5. The suppressor shall be designed so as to minimize the internal surge path impedance. Direct point-to-point internal wiring is inherently inductive and not acceptable. Connection to the power service shall be constructed for best performance.
6. Equipment shall be as manufactured by MCG Electronics, Inc.: Model: 200LS-Family or engineering department approved equal with supporting test data.

D. Protection System Components:

1. Replaceable modules: The suppressor shall be constructed using field replaceable protection modules. The suppressor shall have individually fused and monitored 40mm Metal Oxide Varistors (MOV's), including neutral to ground protection mode. Each module will provide five times (5X) redundant protection, with three modules per each phase and five fuses per module. The status of each module shall be locally monitored with a green LED that becomes red in a fault condition. The transient peak rating of the fuse shall be coordinated with the Ipeak handling capability of the MOV so that the surge path capability is not limited by the series fusing. In addition, each MOV shall incorporate a thermal disconnect means to remove a shorted MOV safely from the protection system.
2. Self-Diagnostics: Red, green and yellow solid state LED indicators shall be provided on the hinged front cover to indicate protection status. An illuminated green LED indicates

power is present at the protector on all phases, and an illuminated red LED shall indicate that one or more of the modules have reduced protection. An illuminated yellow LED shall indicate a suppression event. Both front panel and internal LEDs are required to provide power and fault indications in the event of even the loss of a single fuse or MOV. Relay operation shall be in a fail-safe operating mode (i.e., continuously energized so that power failure, reduced protection, or a break in the remote monitoring line will cause a fault indication at the remote monitor).

3. Remote Alarm Capability: Relay alarm contacts shall be provided for remote alarm monitoring capability of unit status. Form C normally open and normally closed contacts shall be provided with voltage and current limiting protection.
4. Audible Alarm: The specified system shall be equipped with an audible alarm which shall be activated when any one or more of the modules has a reduced protection condition. A mute option shall be provided for the audible alarm.
5. Advanced Diagnostic LED Display: A front panel, microprocessor controlled LED display, in the form of a bar graph, will indicate the protection status of each MOV on each phase including neutral to ground. A event counter will display number of suppressed transient events with a time and date stamp.
6. Integral Disconnect: Unit shall be provided with dead front disconnect to remove power from protector for maintenance access. The disconnect should not be accessed from the front panel unless the unit meets the minimum clamp voltage requirements.
7. NEMA 12 Enclosure: 14 gauge steel, with stainless steel hardware.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION AND MAINTENANCE

- A. The unit shall be installed in accordance with the manufacturer's printed instruction to maintain warranty. All local and national codes must be observed.
- B. Units shall be installed as close as possible to the load side lugs of the main distribution panel board to which it is connected using low impedance Micro-Z cabling.
- C. A 3-pole disconnect shall be provided to insure safety of maintenance personnel.

#### 3.02 TWENTY YEAR WARRANTY

- A. Manufacturer to provide twenty (20) year warranty to cover repair or replacement with a new device. Manufacturer to provide no cost replacement of fused protection modules for the life of the suppressor.

**END OF SECTION 261823**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Distribution panelboards.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NECA Standard of Installation.
- C. NEMA AB1 - Molded Case Circuit Breakers.
- D. NEMA PB1 - Panelboards.
- E. NEMA PB1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- F. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.
- G. NEMA KS1 - Enclosed Switches.

## 1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. New Panelboards
  - 1. Panelboards shall be manufactured by Siemens.
  - 2. Approved equal.

## 2.02 PANELBOARD REQUIREMENTS

- A. Provide panelboards of circuit breaker, dead-front safety type, UL labeled, and meeting all applicable requirements of the National Electrical Manufacturers Association.
- B. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.
- C. Provide electrically isolated neutral bars.
- D. Provide separate ground bars complete with lugs or connectors on bar.
- E. Provide key operated door and door lock. Door shall prevent access to operate circuit breakers.
- F. Provide panelboards with sequence phased bus bars or distributed phase bussing for voltage and phase as indicated on drawings.
- G. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

- H. Provide typed circuit directory cards.
- I. Provide front filler plates for unused breaker knockouts.
- J. Refer to drawings for Ratings and Features.
- K. All bus bars, including ground bars shall be tin-plated copper.
- L. All circuit breakers shall be bolt-on type.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors under provisions of Section 260526.
- B. Install all circuits using a common neutral bus bay in accordance with the National Electric Code. Balance all circuits to achieve not greater than 7% unbalanced neutral current in panel feeders.
- C. Provide six circuit breaker handle lock-on devices for each lighting and miscellaneous power panelboard for installation by the contractor on circuits as directed by the Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, autodial alarm system, etc. Provide spare lock-on devices over to the Engineer.
- D. Install panelboards in accordance with NEMA PB 1.1.
- E. Install panelboards plumb.
- F. Height: 6 feet (2 m) to top of panel board.
- G. Provide typed circuit directory for each branch circuit panelboard. Handwritten circuit directory cards will not be accepted. Revise directory to reflect circuiting changes required to balance phase loads.
- H. Provide a typed circuit directory in accordance with NEC sections 110.22 and 408.4. Circuits shall be labeled with detailed information describing the switches function and equipment location.
- I. Revise directory to reflect circuiting changes required to balance phase loads.
- J. Provide engraved plastic nameplates under the provisions of Section 260553.

#### 3.02 FIELD QUALITY CONTROL

- A. Maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

### END OF SECTION 262400

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Switches, receptacles, thermostats, device plates and other wiring devices as indicated on Drawings.

## 1.02 RELATED SECTIONS

- A. Section 260533 - Raceways and Boxes for Electrical Systems.

## 1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NEMA WD1 - General Purpose Wiring Devices.

## 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Provide manufacturer's catalog information showing dimensions, colors and configuration.

## 1.05 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

## PART 2 - PRODUCTS

## 2.01 SWITCHES

- A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.
- B. Single pole, 20 amp, 120/277 VAC, NEMA WD-1, heavy duty, UL20.
- C. Device Plate: Stainless steel.

## 2.02 RECEPTACLES

- A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.
- B. 20 amp, 125 VAC, NEMA WD-1, heavy duty.
- C. 20 amp, 125 VAC, NEMA WD-1, heavy duty, ground fault circuit interrupter.
- D. Duplex type.
- E. Device Plate: Stainless steel.

## 2.03 EMERGENCY KILL MUSHROOM SWITCH

- A. Acceptable Manufacturers: SQUARE D Model No.: 9001KR9P1RH1321 or approved equal.
- B. Operator: 2-POSITION MAINTAINED PULL-MAINTAINED PUSH ILLUMINATED FLASHING mushroom head pushbutton. Switch head shall only be flashing in the "pushed" position.



- C. Mushroom Head: 2-1/4-inch diameter head.
- D. Nameplate: Large 2.92-inch square, Red nameplate with engraved logo "Emergency Stop", unless noted otherwise on drawings.
- E. Enclosure: Heavy duty, one opening, sheet steel enclosure, NEMA 12.

#### 2.04 MANUAL MOTOR RATED THERMAL SWITCH

- A. Acceptable Manufacturers: SQUARE D, Class 2510, Type KG1A, Type KG2C (3-pole, 600V) or approved equal.
- B. Contractor shall coordinate voltage, phase and current rating with equipment.

#### 2.05 CONTACTORS

- A. Manufacturers: Square D, Model No. LO1000V02.
- B. 4 pole, 30 amp, open type contactor.
- C. Electrically held coil, 120VAC.
- D. Quantity required: Refer to drawings

#### 2.06 TELEPHONE/DATA OUTLETS

- A. Provide combination telephone/data jacks compatible with RJ-45 and RJ-11 cable connections.
- B. Provide "Decora" type with matching vinyl cover plate.
- C. Colors shall be selected by the District.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Mounting:
  - 1. Mount all switches 46-inches above finished floor to center line of switch unless noted otherwise.
  - 2. Mount all receptacles 18-inches above finished floor to center line of receptacle unless noted otherwise.
  - 3. Install switches with OFF position down.
- B. Polarity: Properly wire all receptacles so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.
- C. Grounding: Install all devices in boxes specified under Section 260533 and install a No. 12 green ground wire from device grounding terminal to the outlet box in accordance with the National Electric Code.
- D. Install device plates on switch, receptacle and blank outlets in full contact with wall surface.
- E. Provide new SO cord for all chemical pumps and install plug end to match receptacle.

3.02 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

**END OF SECTION 262726**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Disconnect switches.
- B. Fuses.
- C. Enclosed Circuit Breakers.

## 1.02 REFERENCES

- A. NEMA KS-1 - Enclosed Switches.
- B. ANSI/UL 198C - High Intensity Capacity Fuses, Current Limiting Types.
- C. ANSI/UL 198E - Class R Fuses.
- D. FS W-S 865 - Switch, Box (Enclosed), Surface Mounted.
- E. NEMA AB1 - Molded Case Circuit Breakers.

## 1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Include outlet drawings with dimensions and equipment ratings for voltage, capacity, horsepower and short circuit current ratings.

## 1.04 RELATED SECTION

- A. Section 260553 - Identification for Electrical Systems.

## 1.05 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## PART 2 - PRODUCTS

## 2.01 DISCONNECT SWITCHES

- A. Disconnect switches shall be GENERAL ELECTRIC, heavy-duty Type TH or approved equal.
- B. 75°C conductor ratings.
- C. Ratings: 240VAC
- D. Quick-break, quick-make, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- E. Suitable for use as service entrance equipment.
- F. UL listed for Class R 200,000 RMS amps, symmetrical IC.

- G. Class R fusing kit.
- H. Enclosures: Refer to drawings.

## 2.02 FUSES

- A. Fuses shall be Littlefuse KLNK Class RK1 or approved equal.
- B. Fuses shall be rated for 240 volts AC.
- C. Interrupting Rating: 200,000 RMS amps.

## 2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Install molded case circuit breakers for Main Circuit Breaker, Generator Circuit Breaker and Panel Circuit Breakers.
- B. Molded Case Circuit Breaker:
  - 1. Manufacturer: SIEMENS
    - a. 125 Amp, 3 Pole Type ED6.
    - b. 250 Amp, 3 Pole Type HFD6.
    - c. 400Amp, 3 Pole Type HJD6.
    - d. 600Amp, 3 Pole Type HLD6.
    - e. 800Amp, 3 Pole Type HMD6.
  - 2. AIC Rating: 65,000 amperes.
  - 3. Thermal magnetic with interchangeable trip
- C. Enclosure
  - 1. Manufacturer: SIEMENS
  - 2. Rating: NEMA 1 (for interior use) or NEMA 3R (for exterior use).
  - 3. External Throw.
  - 4. Suitable for Service Entrance Equipment (where applicable).

## 2.04 EXTRA MATERIALS

- A. Provide one complete set based on number of poles of spare fuses for each fused disconnect switch. Provide to Owner.

## PART 3 - EXECUTION

### 3.01 INSTALLATION REQUIREMENTS

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Removed temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Provide switches/enclosed circuit breakers at locations as indicated on drawings.
- D. Refer to disconnect switch schedule on drawings for ampacity ratings, fuse sizes, number of poles and enclosure ratings.
- E. Install fuses in fusible devices.

- F. Install engraved nameplates on each switch and enclosed circuit breaker identifying the following:
  - 1. Switch designated.
  - 2. Load served.
  - 3. Power origination.
  - 4. Fuse size as indicated on drawings.

**3.02 ADJUSTING**

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit breaker trip ranges.

**END OF SECTION 262816**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Automatic transfer switch.

## 1.02 RELATED SECTIONS

- A. Section 012500 - Substitution Procedures.
- B. Section 260000 - Electrical.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems.
- E. Section 263214 - Engine Generator Systems (Natural Gas)

## 1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

## 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, environmental restrictions, voltage, short circuit ratings, enclosure details and all accessories.
- C. Submit manufacturer's installation instructions. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.
- D. Submit manufacturer's operation and maintenance manual as part of shop drawing submittal.

## 1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 017823.
- B. Include instructions for operating equipment.
- C. Include instructions for operating equipment under emergency conditions.
- D. Identify operating limits which may result in hazardous or unsafe conditions, whether switch is being operated automatically or manually.
- E. Document ratings of equipment and each major component.
- F. Include manufacturer's recommended routine preventative maintenance schedule.
- G. List any special tools, maintenance materials and recommended spare parts.

### 1.06 EXTRA SERVICES

- A. The supplier shall include as a part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. The agreement shall include, as a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished and may not be subcontracted. The following services shall be performed once a year.
  - 1. Check switches for loose, bare or broken wiring (replace as needed).
  - 2. Test transfer switch operation, time delays and manual operators.
  - 3. Test transfer switch operations and plant exerciser.
- B. Manufacturer's Instructions: The manufacturer's instructions shall indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.

### 1.07 REGULATORY REQUIREMENTS

- A. Conform to all applicable national, state, city or local codes for standby electrical systems.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Transfer switch shall be ONAN Model X-Series. Sizing restrictions were designed with ONAN Model X-Series.
- B. Transfer switch shall be supplied and warranted for 5 years, including a five-year planned maintenance agreement by the single system source supplier. No exceptions.
- C. Proposal for any substitute equipment shall provide complete submittal data, as specified to the Engineer for approval or disapproval. Physical dimensions of transfer switches are based on ONAN Model X-Series. Substitute equipment shall be field verified for adequate equipment spacing relative to other equipment to be installed in the same locations.
- D. It is intended that all products specified herein be of standard ratings, therefore, the ampere ratings, withstand and closing ratings, etc., shall be the manufacturer's next available larger size of rating until the specifications are exactly met.

### 2.02 AUTOMATIC TRANSFER

- A. Description: NEMA ICS 2; automatic transfer switches.
- B. The switches shall be mechanically held, electrically operated and shall be interlocked mechanically and electrically to insure that normal power and emergency power mixing is impossible. The automatic transfer switches shall be suitable for use with emergency sources.

### 2.03 AUTOMATIC TRANSFER SWITCH

- A. Sequence of Operation: Automatic switching shall occur from normal power to emergency power when there is a phase reversal or when any phase of the normal power drops between an adjustable voltage range of 75 to 98% voltage and to automatically restore the load to normal when all phases are between an adjustable voltage range of 75 to 98% normal voltage or phase rotation is corrected.

- B. Main switch contacts shall be high-pressure silver alloy in order to improve interrupting and withstand capabilities. Main contacts shall be rated for 600 volts AC minimum. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
- C. Transfer switches shall be equipped with transparent protective covers over all live parts of the switch. These covers are to serve as protection to operators or service personnel from contact with live parts, and from contact with arcing by-products if the switches operate with the door open. Barriers shall be transparent to allow for visual inspection for contact position and for damage.
- D. Automatic transfer switches utilizing components of molded case circuit breakers are not acceptable.
- E. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008 and CSA approved.
- F. Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out setting shall be adjustable between 75 and 98% of system voltage. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage. Switches that do not monitor all three phases of both normal and emergency sources will not be acceptable.
- G. Provide frequency sensing relay which will not permit transfer to emergency power until the generator set is operating at 60 Hz.
- H. Control wiring shall be terminated interlocking, plug-type connectors. Operating current for the transfer shall be obtained from the source to which the load is to be transferred.
- I. The controls shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
  - 1. Source 1 OK.
  - 2. Start Generator Set.
  - 3. Source 2 OK.
  - 4. Transfer Timing.
  - 5. Transfer Complete.
  - 6. Retransfer Timing.
  - 7. Retransfer Complete.
  - 8. Timing for Stop.

#### 2.04 RATINGS

- A. Ratings shall be as follows:
  - 1. Voltage: 120/208V, 3 phase, 4 wire.
  - 2. Switched Poles: 4, (overlapping neutral not acceptable).
  - 3. Load Inrush Rating: Combination Load.
- B. All automatic transfer switches shall meet the following withstand ratings as a minimum. In order to protect the system under current or possible future conditions, whether protected by circuit breakers or current limiting fuses, the transfer switches must meet both of the following molded case circuit breaker and current limiting fuse withstand and closing ratings as a minimum. Ratings are stated in symmetrical RMS amperes for three phase faults.
  - 1. Transfer Amperage: 400



2. WCR @ 480 Volts W/Molded Case C/B'S: 65,000
  3. WCR @ 480 Volts W/Current Limit Fuses: 200,000
- C. Transfer switches shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet.

#### 2.05 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay to Start Alternate Source Engine Generator: 0 to 15 seconds, adjustable.
- C. Engine Start: Automatic controls shall signal the engine-generator set to start upon a signal from normal source sensors, after time delay to start has terminated.
- D. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- E. Time Delay Before Transfer to Alternate Power Source: 2 to 120 seconds, adjustable.
- F. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- G. Time Delay Before Retransfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in the event of the alternate source failing.
- H. Time Delay Before Engine Shut Down: 0 to 10 minutes, adjustable, of unloaded operation; factory set at 5 minutes.
- I. Engine Exerciser: An Exerciser shall, once a week, start the generator set, transfer building load to the generator sets and after a set period of time, transfer the building load back to normal power. It shall be readily accessible and easy to start. Exercisers shall be furnished with load/no load selector switches. Provide bypass exerciser controls if the normal source fails during the exercise period.

#### 2.06 ENCLOSURE

- A. Enclosures: Transfer switch enclosure shall be NEMA 1. All controls which will be located on cabinets shall be key operated. Manual operating handles and all control switches, (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet doors. Transfer switches with manual operating handles and/or non key-operated control switches located on the outside of the cabinet do not meet this specification and are not acceptable.

#### 2.07 ACCESSORIES

- A. Indicating Lights: Mounted in cover of enclosure to indicate the following. Source light for AC power loss shall be 30.5 mm heavy duty oiltight press-to-test by SIEMENS.
  1. NORMAL SOURCE AVAILABLE.
  2. EMERGENCY SOURCE AVAILABLE.
  3. NORMAL SWITCH POSITION.
  4. EMERGENCY SWITCH POSITION..
  5. AC POWER FAILURE.
- B. Emergency Kill Switch Pushbutton (Maintained): When depressed shall shut down generator. This switch shall be in series with new exterior emergency kill switch.

- C. Transfer Switch Main Shaft Auxiliary Contacts: Two normally open; two normally closed. Wired to terminal block for easy access for indication of switch position. Rated at 10 Amps continuous and 250 VAC maximum.
- D. Transfer switches are to be equipped with permanently attached operating handles and quick-break, quick-make mechanisms suitable for normal operation under load. Loose manual operating handles that need to be field attached for operation will not be acceptable.
- E. All transfer switches shall be provided with a field adjustable time delay during the switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor/inphase type monitors are not acceptable.
- F. Provide generator 20 light remote annunciator located inside the electrical room on the ATS Cubicle. Interface generator set controls with battery charger and fuel tank alarms for all status conditions. Provide all power, control wiring including conduits.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Installation of transfer switches shall be in accordance with manufacture requirements. Provide applicable U.L. labeling for installed system.

#### 3.02 POWER OUTAGE

- A. After the transfer switch is installed, the Contractor shall be responsible to inspect the installation and field verify that the switch has been installed per manufacturer's recommendations. Owner's operating personnel shall be instructed on the use and service requirements of the transfer switch by the manufacturer. A minimum of two (2) hours manufacturers training is required.

#### 3.03 DEMONSTRATION

- A. Demonstrate operation of transfer switch under provisions.

### END OF SECTION 262917

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Automatic transfer switch.

## 1.02 RELATED SECTIONS

- A. Section 012500 - Substitution Procedures.
- B. Section 260000 - Electrical.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems.
- E. Section 263214 - Engine Generator Systems (Natural Gas)

## 1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

## 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, environmental restrictions, voltage, short circuit ratings, enclosure details and all accessories.
- C. Submit manufacturer's installation instructions. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.
- D. Submit manufacturer's operation and maintenance manual as part of shop drawing submittal.

## 1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 017823.
- B. Include instructions for operating equipment.
- C. Include instructions for operating equipment under emergency conditions.
- D. Identify operating limits which may result in hazardous or unsafe conditions, whether switch is being operated automatically or manually.
- E. Document ratings of equipment and each major component.
- F. Include manufacturer's recommended routine preventative maintenance schedule.
- G. List any special tools, maintenance materials and recommended spare parts.

## 1.06 EXTRA SERVICES

- A. The supplier shall include as a part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. The agreement shall include, as a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished and may not be subcontracted. The following services shall be performed once a year.
  - 1. Check switches for loose, bare or broken wiring (replace as needed).
  - 2. Test transfer switch operation, time delays and manual operators.
  - 3. Test transfer switch operations and plant exerciser.
- B. Manufacturer's Instructions: The manufacturer's instructions shall indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.

## 1.07 REGULATORY REQUIREMENTS

- A. Conform to all applicable national, state, city or local codes for standby electrical systems.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Transfer switch shall be ONAN Model X-Series. Sizing restrictions were designed with ONAN Model X-Series.
- B. Transfer switch shall be supplied and warranted for 5 years, including a five-year planned maintenance agreement by the single system source supplier. No exceptions.
- C. Proposal for any substitute equipment shall provide complete submittal data, as specified to the Engineer for approval or disapproval. Physical dimensions of transfer switches are based on ONAN Model X-Series. Substitute equipment shall be field verified for adequate equipment spacing relative to other equipment to be installed in the same locations.
- D. It is intended that all products specified herein be of standard ratings, therefore, the ampere ratings, withstand and closing ratings, etc., shall be the manufacturer's next available larger size of rating until the specifications are exactly met.

### 2.02 AUTOMATIC TRANSFER

- A. Description: NEMA ICS 2; automatic transfer switches.
- B. The switches shall be mechanically held, electrically operated and shall be interlocked mechanically and electrically to insure that normal power and emergency power mixing is impossible. The automatic transfer switches shall be suitable for use with emergency sources.

### 2.03 AUTOMATIC TRANSFER SWITCH

- A. Sequence of Operation: Automatic switching shall occur from normal power to emergency power when there is a phase reversal or when any phase of the normal power drops between an adjustable voltage range of 75 to 98% voltage and to automatically restore the load to normal when all phases are between an adjustable voltage range of 75 to 98% normal voltage or phase rotation is corrected.

- B. Main switch contacts shall be high-pressure silver alloy in order to improve interrupting and withstand capabilities. Main contacts shall be rated for 600 volts AC minimum. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
- C. Transfer switches shall be equipped with transparent protective covers over all live parts of the switch. These covers are to serve as protection to operators or service personnel from contact with live parts, and from contact with arcing by-products if the switches operate with the door open. Barriers shall be transparent to allow for visual inspection for contact position and for damage.
- D. Automatic transfer switches utilizing components of molded case circuit breakers are not acceptable.
- E. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008 and CSA approved.
- F. Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out setting shall be adjustable between 75 and 98% of system voltage. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage. Switches that do not monitor all three phases of both normal and emergency sources will not be acceptable.
- G. Provide frequency sensing relay which will not permit transfer to emergency power until the generator set is operating at 60 Hz.
- H. Control wiring shall be terminated interlocking, plug-type connectors. Operating current for the transfer shall be obtained from the source to which the load is to be transferred.
- I. The controls shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
  - 1. Source 1 OK.
  - 2. Start Generator Set.
  - 3. Source 2 OK.
  - 4. Transfer Timing.
  - 5. Transfer Complete.
  - 6. Retransfer Timing.
  - 7. Retransfer Complete.
  - 8. Timing for Stop.

#### 2.04 RATINGS

- A. Ratings shall be as follows:
  - 1. Voltage: 120/208V, 3 phase, 4 wire.
  - 2. Switched Poles: 4, (overlapping neutral not acceptable).
  - 3. Load Inrush Rating: Combination Load.
- B. All automatic transfer switches shall meet the following withstand ratings as a minimum. In order to protect the system under current or possible future conditions, whether protected by circuit breakers or current limiting fuses, the transfer switches must meet both of the following molded case circuit breaker and current limiting fuse withstand and closing ratings as a minimum. Ratings are stated in symmetrical RMS amperes for three phase faults.
  - 1. Transfer Amperage: 800

2. WCR @ 480 Volts W/Molded Case C/B'S: 65,000
  3. WCR @ 480 Volts W/Current Limit Fuses: 200,000
- C. Transfer switches shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet.

#### 2.05 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay to Start Alternate Source Engine Generator: 0 to 15 seconds, adjustable.
- C. Engine Start: Automatic controls shall signal the engine-generator set to start upon a signal from normal source sensors, after time delay to start has terminated.
- D. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- E. Time Delay Before Transfer to Alternate Power Source: 2 to 120 seconds, adjustable.
- F. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- G. Time Delay Before Retransfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in the event of the alternate source failing.
- H. Time Delay Before Engine Shut Down: 0 to 10 minutes, adjustable, of unloaded operation; factory set at 5 minutes.
- I. Engine Exerciser: An Exerciser shall, once a week, start the generator set, transfer building load to the generator sets and after a set period of time, transfer the building load back to normal power. It shall be readily accessible and easy to start. Exercisers shall be furnished with load/no load selector switches. Provide bypass exerciser controls if the normal source fails during the exercise period.

#### 2.06 ENCLOSURE

- A. Enclosures: Transfer switch enclosure shall be NEMA 1. All controls which will be located on cabinets shall be key operated. Manual operating handles and all control switches, (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet doors. Transfer switches with manual operating handles and/or non key-operated control switches located on the outside of the cabinet do not meet this specification and are not acceptable.

#### 2.07 ACCESSORIES

- A. Indicating Lights: Mounted in cover of enclosure to indicate the following. Source light for AC power loss shall be 30.5 mm heavy duty oiltight press-to-test by SIEMENS.
  1. NORMAL SOURCE AVAILABLE.
  2. EMERGENCY SOURCE AVAILABLE.
  3. NORMAL SWITCH POSITION.
  4. EMERGENCY SWITCH POSITION..
  5. AC POWER FAILURE.
- B. Emergency Kill Switch Pushbutton (Maintained): When depressed shall shut down generator. This switch shall be in series with new exterior emergency kill switch.

- C. Transfer Switch Main Shaft Auxiliary Contacts: Two normally open; two normally closed. Wired to terminal block for easy access for indication of switch position. Rated at 10 Amps continuous and 250 VAC maximum.
- D. Transfer switches are to be equipped with permanently attached operating handles and quick-break, quick-make mechanisms suitable for normal operation under load. Loose manual operating handles that need to be field attached for operation will not be acceptable.
- E. All transfer switches shall be provided with a field adjustable time delay during the switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor/inphase type monitors are not acceptable.
- F. Provide generator 20 light remote annunciator located inside the electrical room on the ATS Cubicle. Interface generator set controls with battery charger and fuel tank alarms for all status conditions. Provide all power, control wiring including conduits.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Installation of transfer switches shall be in accordance with manufacture requirements. Provide applicable U.L. labeling for installed system.

#### 3.02 POWER OUTAGE

- A. After the transfer switch is installed, the Contractor shall be responsible to inspect the installation and field verify that the switch has been installed per manufacturer's recommendations. Owner's operating personnel shall be instructed on the use and service requirements of the transfer switch by the manufacturer. A minimum of two (2) hours manufacturers training is required.

#### 3.03 DEMONSTRATION

- A. Demonstrate operation of transfer switch under provisions.

### END OF SECTION 262917.11

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Packaged engine generator set.
- B. Exhaust piping, fittings, silencer and insulation.
- C. Control panels.
- D. Battery and charger.
- E. Vibration isolation.

1.02 RELATED SECTIONS

- A. Section 012500 - Substitution Procedures.
- B. Section 262917 - Transfer Switch (Wall Mount)

1.03 REFERENCES

- A. NEMA AB1 - Molded Case Circuit Breakers.
- B. NEMA MG1 - Motors and Generators.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. ANSI/NFPA 70 - National Electric Code.
- E. NFPA 110 - Emergency Standby Systems.
- F. NFPA 30 - Flammable and Combustible Liquids Code.
- G. NFPA 37 - Installation of Stationary Engines.
- H. NFPA 101 - Life Safety Code.

1.04 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.
- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, radiator and derating schedules, operating performance, exhaust flow data, and cooling system data. Submit generator alternator output curves, deration curves and temperature data on the complete genset individual components.
- D. Test Reports: Indicate results of performance testing including 0.8 power factor test at 100 percent load.



- E. Prototype Test Reports: Submittals will not be received without submission of prototype test reports. No exceptions.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product. Provide typical system interconnection wiring diagrams.
- G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- H. Manufacturer's Field Reports: Submit under provisions of Section 017500. Indicate procedures and findings.

#### 1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 017823.
- B. Operation Data: Include instructions for normal operation.
- C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

#### 1.06 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 110.

#### 1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years experience, and with an authorized distributor offering 24-hour parts and service availability within 50 miles of the project. The manufacturer shall fabricate the engines, generators and control panel. Automatic transfer switches and generator enclosures shall be supplied, warranted and serviced by a single system source supplier.
- B. Supplier: Authorized distributor of specified manufacturer with minimum six years documented experience with specified products and factory-trained service technicians. The supplier must be factory authorized to perform warranty service on the entire system, including but not limited to, the engines, generators, control panels and automatic transfer switches. The supplier must show proof of factory trained service technicians on all components.
- C. The complete engine generator system shall be standard of a single manufacturer. It shall be factory built, tested and shipped by this single manufacturer.

#### 1.08 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 and NFPA 110.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

#### 1.09 EXTRA SERVICES

- A. The single source supplier shall provide as part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. This warranty shall cover the generator system, transfer switches and generator enclosures. Agreement shall include, as

a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished, and may not be subcontracted. The following services shall be performed once a year.

1. Replace engine-lubricating oil and remove used oil from premises.
2. Replace oil and fuel filters.
3. Check coolant system for proper levels and condition. Replace coolant filters and add corrosion inhibitor as needed.
4. Check air filter.
5. Check and clean crankcase breathers.
6. Check turbocharger free-spin and end play.
7. Check and adjust belts as required.
8. Check engine for loose, bare or broken wiring. Replace as needed.
9. Check entire equipment for fuel or water leaks.
10. Check condition of batteries and report any action necessary for recharging or replacing.
11. Start and run all engines, check temperatures and pressures.
12. Test engine safety shutdown systems.
13. Test all transfer switches operation and time delays.
14. Submit a report of this inspection to the Owner and advise of any further work required.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. ONAN CORPORATION, Minneapolis, Minnesota, or specifically approved equal.
- B. Proposal for any substitute equipment shall provide complete submittal data, as specified in Section 012500 - Substitution Procedures and specified herein, to the Engineer for approval or disapproval. The supplier must submit detailed sizing calculations for each generator to verify models are capable of picking up the entire loads with voltage dips as herein specified.
- C. Approval of Substitute Equipment: Design has been based on ONAN Model Generators. If substitute equipment is approved, the contractor shall be responsible for the charges of any necessary revisions to the plans and specifications, drawings, and project documentation; and charges related to equipment spacing, enclosure sizes, foundation sizes, mounts, electrical wiring, ventilation equipment, fuel, exhaust components, etc., as well as any engineering costs. Also, the supplier must furnish a list of completed installations, including name, address and telephone number of at least five comparable installations which can prove the proposed products have operated satisfactorily for three years.
- D. It is intended that all products specified herein be of standard ratings, therefore, the KW and KVA, starting KVA and maximum allowable voltage dip, ratings, etc., shall be the manufacturer's next size or rating to exactly meet the specifications. No exceptions.

### 2.02 SYSTEM REQUIREMENTS

- A. The engine generator shall start and provide continuous power to the loads with 100 percent block loading at the time of transfer.

### 2.03 NATURAL GAS ENGINE GENERATOR SET

- A. Rating: The AC engine generator set, ONAN Model C60 N6 and shall be rated by the manufacturer for standby operation at 60 KW/75 KVA at 0.8 PF, 60 Hz, 1800 RPM for use at 120/208 volts, 3 phase, 4 wire. Ratings shall be at an elevation of 500 feet above sea level, and at 104 degrees F.
  1. Voltage regulation shall be plus or minus 1 percent of rated voltage for any constant load between no load and rated load.

2. Frequency regulation shall be isochronous under varying from no load to 100% rated load.
  3. Random Voltage Variation: The cyclic variations in RMS voltage shall not exceed plus or minus 1% of rated speed for constant loads from no load to rated load, with constant ambient and operating temperature.
  4. Random Frequency Variation: Speed variations for constant loads from no load to rated load shall not exceed plus or minus 0.25% of rated speed, with constant ambient and operating temperature.
  5. Telephone Harmonic Distortion: The sum of AC voltage waveform harmonics, from no load to full linear load, shall not exceed 5% of rated voltage (L-N, L-L, L-L-L) and no single harmonic shall exceed 3% of rated voltage.
  6. Telephone Influence Factor: TIF shall be less than 50 per NEMA MG1-22.43.
  7. The diesel engine generator set shall be capable of picking up 100% of nameplate KW and power factor in one step with the engine generator set at operating temperature, in accordance with NFPA Standard 110, Paragraph 5-13.2.6.
  8. The maximum allowable engine BMEP on the engine shall not exceed 224 psi at 100% rated load.
  9. The engine generator shall start and provide power to the loads in the following step starting sequence with a maximum instantaneous voltage dip of 30% and a maximum frequency dip of 10%.
  10. The generator shall at a minimum provide the following performance.
- B. The alternator performance shall be designed to provide a minimum of 350 locked rotor KVA at a maximum voltage dip of 35%.
- C. The following performance verifications shall be provided for substitute generators.
1. Submit five copies of generator sizing program based upon the specified step/starting sequence and associated voltage/frequency dips and required starting KVA.
  2. As part of the substitution requirements the contractor shall enter all design step/starting sequence loads into the manufacturer's generator sizing program in the presence of the engineer to verify model proposed by substitute manufacturer meets the specified requirements for ambient temperature, site altitude, voltage dip, frequency dip, and starting KVA.

#### 2.04 AC GENERATOR, REGULATOR AND EXCITER UNIT

- A. The AC generator, exciter and voltage regulator shall be designed and manufactured by the engine generator set manufacturer as a complete generator system.
- B. The AC generator shall be synchronous, four pole, revolving field, dripproof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan and directly connected to the engine with flexible drive discs. The armature shall have skewed laminations of insulated electrical grade steel, two-thirds pitch windings in order to minimize field heating and voltage harmonics. The rotors shall have amortisseur (damper windings) layer wound mechanically wedged winding construction. The rotors shall be dynamically balanced. The exciters shall be brushless, three phase, with full wave silicon diodes mounted on the rotating shaft and a surge suppressor connected in parallel with the field winding. Field discharge resistors shall not be acceptable. Systems using three wire solid state devices (such as SCRs or transistors) mounted on the rotor shaft shall not be acceptable.
- C. All insulation system components shall meet NEMA MG1 standard temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees C to provide additional allowance for internal hot spots. The main generator and exciter insulation systems must be suitably impregnated for operation in severe environments for resistance to sand, salt and sea spray.

- D. Generator shall be a Permanent Magnet Generator (PMG). Permanent magnet generators shall provide excitation power to the automatic voltage regulator for immunity from voltage distortion caused by nonlinear SCR controlled loads on the generator. The PMG's shall sustain main field excitation power for optimum motor starting and to sustain short circuit current for selective operation and coordination of system overcurrent devices.

## 2.05 ENGINE GENERATOR SET CONTROLS

- A. The generator sets shall be provided with microprocessor-based control systems which are designed to provide automatic starting, monitoring, and control functions for the generator set. The control systems shall also be designed to allow local monitoring and control of the generator sets, and remote monitoring and control as described in this specification. The controls shall be mounted on the generator sets, and shall be vibration isolated and prototype tested to verify the durability of all components in the system under vibration conditions encountered. The controls shall be UL-508 labeled, CSA282-M1989 certified, and meet IEC-8528 part 4. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure doors shall be gasketed. There shall be no exposed points in the controls (with the door open) that operate in excess of 50 volts. The controls shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std. 801.2, 801.3 and 801.5 for susceptibility, conducted and radiated electromagnetic emissions. The entire controls shall be tested and meet the requirements of IEEE587 for voltage surge resistance. The generator set mounted controls shall include the following features and functions:
1. Three position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
  2. Red "mushroom-head" push-button EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
  3. Push-button RESET Switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
  4. Generator Set AC Output Metering: The generator set shall be provided with a metering set with the following features and functions:
    - a. 2.5-inch, 90 degree scale analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter. These meters shall be provided with a phase select switch and an indicating lamp for upper and lower scale on the meters. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.
    - b. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.
  5. Generator Set Alarm and Status Message Display: The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel:
    - a. Low Oil Pressure (alarm)
    - b. Low Oil Pressure (shutdown)
    - c. Oil Pressure Sender Failure (alarm)
    - d. Low Coolant Temperature (alarm)
    - e. High Coolant Temperature (alarm)

- f. High Coolant Temperature (shutdown)
  - g. Engine Temperature Sender Failure (alarm)
  - h. Fail to Crank (shutdown)
  - i. Overcrank (shutdown)
  - j. Overspeed (shutdown)
  - k. Low DC Voltage (alarm)
  - l. Low Coolant Level (alarm or shutdown-selectable)
  - m. High DC Voltage (alarm)
  - n. Weak Battery (alarm)
  - o. Low Fuel-Daytank (alarm)
  - p. High AC Voltage (shutdown)
  - q. Low AC Voltage (shutdown)
  - r. Under Frequency (shutdown)
  - s. Over Current (warning)
  - t. Over Current (shutdown)
  - u. Short Circuit (shutdown)
  - v. Ground Fault (alarm)
  - w. Over Load (alarm)
  - x. Emergency Stop (shutdown)
    - 1) In addition, provisions shall be made for indication of two customer-specified or future alarm or shutdown conditions. These two alarm conditions shall be interfaced with leak detection/overfill alarm panel for overfill and leak detection. Labeling of the customer specified or future alarm or shutdown conditions shall be of the same type and quality as the above specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate the generator set is not able to automatically respond to a command to start from a remote location.
6. Engine Status Monitoring: The following information shall be available from a digital status panel on the generator set control:
- a. Engine Oil Pressure (psi or kPa)
  - b. Engine Coolant Temperature for left and right block temperatures (degrees F or C; both)
  - c. Engine Oil Temperature (degrees F or C)
  - d. Engine Speed (rpm)
  - e. Number of Hours of Operation (hours)
  - f. Number of Start Attempts
  - g. Battery Voltage (DC volts)
7. Control Functions: The control system shall provide for the following functions:
- a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, reset time, and number of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
  - b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
  - c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
  - d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.

- e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure condition.
- 8. Alternator Control Functions: The generator set control shall include the following alternator control functions:
  - a. The generator set shall include an automatic voltage regulation system which is matched and prototype tested with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control build up of AC generator voltage to provide a linear rise and limit overshoot. The systems shall include a torque-matched characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58-59 HZ. The voltage regulator shall include adjustments for gain, damping and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alpha-numeric LED readout to indicate setting level.
  - b. The voltage regulation system shall include provisions for reactive load sharing and electronic voltage matching for paralleling applications. Motorized voltage adjust pot is not acceptable for voltage matching.
  - c. Controls shall be provided to monitor the output current of the generator set and initiate an alarm when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator.
  - d. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition when total load on the generator set exceeds the generator set rating for in excess of 5 seconds.
  - e. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
  - f. An AC over/under voltage monitoring system which responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
  - g. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32VDC. During engine starting, the low voltage limit shall be disabled, and if DC voltage drops to less than 14.4 volts for more than two seconds a "weak battery" alarm shall be initiated.
  - h. The control system shall include a ground fault monitoring relay. The relay shall be adjustable from 100-1200 amps, and include adjustable time delay of 0-1.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay which will function correctly in system as installed.
- 9. Control Interfaces for Remote Monitoring: All control and interconnection points from the generator set to remote components shall be brought to a separate connection box. No field connections shall be made in the control enclosure or in the AC power output enclosure. Provide the following features in the control system:
  - a. Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
  - b. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
  - c. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.

- d. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
- e. The control shall be provided with provisions for connection of remote monitoring equipment as described herein or shown on the drawings.

## 2.06 ENGINES

- A. The natural gas engine shall be manufactured by Cummins Engine Company and designed specifically for generator set duty. The natural gas engine shall be 4 cycle, natural gas fueled, direct injection, 1800 RPM, with forged steel crankshaft and connecting rods. Minimum engines shall be 359 cubic inches. Engines shall have a minimum of 6 cylinders. The cylinder blocks shall be cast iron with replaceable wet liners and have four valves per cylinder. The engines shall be turbocharged and aftercooled.
- B. Two cycle engines will not be acceptable.
- C. Electronic governor systems shall provide automatic isochronous frequency regulation. The engine governing systems shall not utilize any exposed operating linkage.
- D. The engines shall be cooled by a unit-mounted closed loop radiator system including belt-driven pusher fan, coolant pump and thermostat temperature control. The cooling systems shall be rated for full rated load operation in 104 degrees F (40 degrees C) ambient condition. The cooling capability of the generator sets shall be demonstrated by prototype tests on a representative generator set model conducted by the generator set manufacturer; calculated data from the radiator manufacturer only is not sufficient. Radiators shall be provided with a duct adapter flange permitting the attachment of an air discharge duct to direct the radiator air outside according to the manufacturer's instructions.
- E. Rotating parts shall be guarded against accidental contact per OSHA requirements.
- F. The maximum radiator cooling air shall not exceed 5600 scfm. The maximum alternator cooling air shall not exceed 149.1 cfm for the genset. The maximum allowable static restriction shall not exceed 0.5 inches of water. The entire cooling air system is based on the above data. All costs incurred if an alternate manufacturer is purchased shall be the responsibility of the electrical contractor. These costs shall include costs to all other trades as well as any associated engineering fees.

## 2.07 ENGINE ACCESSORY EQUIPMENT

- A. The engine generator sets shall include the following accessories:
  - 1. Electric starters capable of three complete cranking attempts without overheating, before overcrank shutdown (75 seconds).
  - 2. Positive displacement, mechanical, full pressure, lubrication oil pumps. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicators. Provide bypass oil filters.
  - 3. Replaceable heavy duty dry element air cleaners with restriction indicators and safety element.
  - 4. Engine mounted battery charging alternators, 45 ampere and solid-state voltage regulators.
  - 5. Anti-condensation heater for alternator.

## 2.08 BASES

- A. The engine-generator set shall be mounted on a heavy duty steel base to maintain proper alignment between components. The engine-generator set shall incorporate battery trays with

battery holddown clamps on the base rails. Provisions for stub up of electrical connections shall be within the footprint of the generator set base rails and within the basetanks as specified in the housing section of the specification. Vibration isolators, spring type, shall be provided to be mounted under the generator set base.

## 2.09 GENERATOR SETS CIRCUIT BREAKERS

- A. Generator main circuit breaker shall be solid state UL listed, molded case type, rated as listed below. Circuit breakers shall be mounted in a separate NEMA 1 enclosure and be shipped completely wired to the gensets. No exceptions. Enclosures shall include neutral blocks for field connection.
- B. Solid State circuit breakers shall be 100% rated: Refer to drawings for sizes.
- C. Circuit breaker (CB) shall be long time current and instantaneous pickup with solid state trip unit. CB shall have visible mechanical fault indicator and push button trip.
- D. Circuit breakers shall be rated at 65,000 AIC.
- E. Provide auxiliary contacts on breaker position.

## 2.10 EXHAUST SYSTEMS

- A. One exhaust silencer shall be provided for the generator set. The silencer shall be super critical grade. The silencer shall reduce total noise a minimum of 40 dBA at three feet.
- B. The exhaust silencer shall be HARCO super critical bottom inlet/side outlet Model 5214-SFH-8 shall be mounted inside the sound attenuated enclosure. Provide all fittings, reducers, couplings elbows and spool pieces.
- C. All exterior fittings, accessories and bolts shall be type 304 stainless steel. Provide heat resistant gaskets between all flanged connections to serve as dielectric protectors.
- D. The maximum gas flow shall not exceed 476 cfm. The exhaust gas temperature shall not exceed 1286 degrees F. The maximum back pressure shall not exceed 28.1 inches of water. The design of the entire exhaust system is based on the above data. If a substitution of model specified is made, all costs incurred to redesign as well as costs to other trades to modify the layout shall be the complete responsibility of the electrical contractor.
- E. Provide stainless steel flexible exhaust connections for the engine as required for connection between the engine exhaust manifolds and exhaust lines in compliance with applicable codes and standards.
- F. Provide an exhaust system condensation trap with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from enter-ing the engine.
- G. Provide a suitable weather cap at the stack outlet with all necessary flanges and fittings for proper installa-tion. The weather cap shall have the proper counter weights attached to prevent banging while generator is unloaded.
- H. Thermal jacket for interior exhaust lines and silencer by FIRWIN CORP. or engineered approved equal. Jacket thickness shall be sufficient to maintain a surface temperature of less than 200 degrees F.
- I. Exhaust mufflers shall be installed by enclosure manufacturer so their weight is not supported by the engines.



**2.11 ACCESSORIES**

- A. Vibration isolators: Spring type.
- B. Starting and control Batteries: Two (2) 24 volt starting batteries each genset, lead acid type, 24 volt DC (12 volt DC will not be accepted), sized to accommodate 45 seconds of cranking at an ambient of 0 degrees F without being recharged.
- C. Battery Chargers: One 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of :
  - 1. Loss of AC Power - red light.
  - 2. Low Battery Voltage - red light.
  - 3. High Battery Voltage - red light.
  - 4. Power ON - green light (no relay contact).
- D. Block Heaters: Thermostatically controlled jacket water heater shall be supplied for each genset with a minimum size shall be 4990 watts. Input voltage of heaters shall be 208 VAC 1 phase.
- E. Provide generator 20 light remote annunciator located inside the electrical room on the ATS Cubicle. Interface generator set controls with battery charger and fuel tank alarms for all status conditions. Provide all power, control wiring including conduits.

**2.12 ENCLOSURE**

- A. The generator set shall be provided with a factory-installed sound attenuated housing which allows the generator set to operate at full rated load in the ambient conditions previously specified. The enclosure shall reduce the sound level of the generator set while operating at full rate load to a maximum of 75 dBA at any location 7 meters from the generator set in a free field environment. Housing materials used shall be steel. Fiberglass and plastic are not acceptable. Acoustical materials used shall be oil and water resistant. No foam materials shall be used.
- B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment and a hinged rear see-through control door. Key-locking and padlockable door latches shall be provided for all doors. Door hinges shall be stainless steel.
- C. The enclosure shall be provided with an exhaust silencer which is mounted on top of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a rain cap and rain shield.
- D. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. Metal part surfaces shall be prepared, primed and painted. The painting process shall result in a coating which meets the following requirements:
  - 1. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
  - 2. Gloss, per ASTM D523, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
  - 3. Crosshatch adhesion, per ASTM D3359, 4B-5B.
  - 4. Impact resistance, per ASTM D2794, 120-160 inch pounds.
  - 5. Salt spray, per ASTM B117, 1000+ hours.
  - 6. Humidity, per ASTM D2247, 1000+ hours.
  - 7. Water Soak, per ASTM D2247, 1000+ hours.

- E. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts will not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work. The enclosure shall be built and tested by the engine generator manufacturer.

### 2.13 SOURCE QUALITY CONTROL

- A. To provide proven reliability of the system, three series of tests shall be performed: prototype model tests, production model tests and field tests. The manufacturer shall provide documentation demonstrating satisfactory prototype and production test results. Generator sets that have not been prototype tested and factory tested at 0.8 PF will not be acceptable.
- B. Generator Set Factory Production Tests and Evaluation: These tests and evaluations must have been performed on a prototype generator set representative of the Model specified. A summary of the generator set testing results shall be submitted for review. The manufacturer's standard series of components development tests on the generator system, engine and other major components shall also be performed and available for review, but shall not be acceptable as a substitute for prototype testing on the complete representative generator set prototype.
- C. Torsiograph Analysis and Test: The manufacturer of the generator set shall verify that the engine generator set, as configured, is free from harmful torsional stresses. The analysis shall include correlation of empirical data from tests on a representative prototype. The empirical data must include spectrum analysis of the torsional transducer output within the operating speed range of the engine generator set. Calculations based on engine and generator separately are not acceptable.
- D. Temperature Rise Test: Complete thermal evaluation of a prototype generator rotor and starter must include actual measurement of internal generator and exciter temperatures by embedded detector method, and measurement of average temperature rise by resistance method. No position measured any place in the windings may exceed the temperature rise limits of NEMA for the particular type of insulation system used. Resistance method temperature rise data shall be confirmed by a full load test on the generator set prototype to include conducted and radiated heat from the engine.
- E. Short Circuit Test: A test on a prototype generator set shall have demonstrated that the generator set is designed to withstand the mechanical forces associated with a short circuit condition. With the generator set operating at rated load and speed, the generator terminals must be short circuited on all three phases for a duration of 20 seconds. At the conclusion of this test, the generator set must be capable of full load operation.
- F. Endurance Run Test: A minimum of 500 continuous hours of endurance testing with a representative generator set prototype operating as defined by the manufacturer's standby rating shall have been performed. Endurance testing shall be used to verify structural soundness and durability.
- G. Maximum Power Test: With the prototype generator set at normal operating temperature and with all power consuming auxiliaries in place, the maximum power available at rated speed shall be determined with the governor set at its fuel stop. The generator set shall maintain this power for a minimum of two minutes.
- H. Linear Vibration Test: A test for in-line motion of components occurring along a repeatable path shall meet the manufacturer's acceptance criteria.
- I. Cooling System Test: A cooling system test shall demonstrate the ability of the generator set cooling system to maintain normal operating temperature while operating at full rated load and power factor at the highest ambient temperature (122°F) of the system rating. Cooling air

requirements, radiator air flow and maximum allowable restriction at radiator discharge, shall be verified by this test.

- J. Maximum Motor Starting KVA: Motor starting KVA shall be determined by test, based on a sustained RMS recovery voltage of at least 90 percent of no load voltage with the specified load KVA at near zero power factor applied to the generator set.
- K. Transient Response, Steady State Speed Control and Voltage Regulation: Prototype generator set tests shall demonstrate consistent performance as follows; stable voltage and frequency at all loads from no load to full rated load, consistent frequency backwidth with steady state load, maximum voltage and frequency kp on load acceptance and rejection and restoration to steady state after sudden load changes. Transient response is a complete generator set (engine, generator, exciter, and regulator) performance criteria and cannot be established on generator data alone.
- L. Witnessed Generator Set Factory Production Tests: On the equipment to be shipped, an 8-hour test shall be performed at rated load and 0.8 PF. These tests shall include certified data to document the following: run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup and safety shutdowns. Provide a factory certified test record of the production testing. Certified test record shall be sealed by a licensed professional engineer.

#### 2.14 WARRANTY

- A. Provide a 5-year manufacturer's limited warranty, including 100% parts and labor. The complete electrical power system, including but not limited to, generator set, controls, associated switches, enclosures, and accessories, as provided by the single source manufacturer, shall be warranted by the manufacturer against defects in materials and workmanship for a period of five (5) years from the date of system startup. Coverage shall include parts, labor, travel expenses, and labor to remove/reinstall the equipment, per ONAN's standard published limited warranty. Supplier must be factory authorized to perform warranty service on the entire system, including, but not limited to, the engine, the generator, the control panels, and the automatic transfer switches.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install engine generator and all appurtenances in accordance with manufacturer's recommendations.
- B. Enclosure manufacturer shall install all exhaust components as shown on the drawings and as required to comply with NFPA 37 and local codes and regulations. Components shall be sized to assure full load operation without excessive backpressure sized as per manufacturer's recommendations with actual site dimensions when installed as shown on the drawing. Make provisions as required for pipe expansion and contraction.
- C. Coordinate installation of anchor bolts with generator enclosure manufacturer.
- D. Installation shall comply with applicable State and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

**3.02 FIELD QUALITY CONTROL**

- A. Initial startup and field acceptance tests are to be conducted by the authorized representative of the system manufacturer who supplies the equipment.
- B. Test data shall be collected and recorded on the following: time of day, coolant temperature, operating oil pressure, battery charging rate, cranking time, crank-to-rated frequency time, voltage and frequency overshoot, load assumption-to-steady state voltage and frequency stabilization time, operating voltage, frequency, current, kilowatts and power factor. All data shall be taken every fifteen (15) minutes.
- C. Procedure: Generator manufacturer shall conduct a six (6) hour load bank test at 1.0 power factor for each generator set. Contractor shall provide load bank for testing generator set at 100% load. Contractor is not permitted to use load bank specified as part of the testing requirements. Load bank test shall test generator at full nameplate KW rating. Generator manufacturer's representative shall record test data, as described in (B) above. Test data shall be tabulated and typed for submission and approval by the engineer for final acceptance. No handwritten field notes will be allowed.

**END OF SECTION 263214**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Packaged engine generator set.
- B. Exhaust piping, fittings, silencer and insulation.
- C. Control panels.
- D. Battery and charger.
- E. Vibration isolation.

## 1.02 RELATED SECTIONS

- A. Section 262917 – Wall Mount Transfer Switch.

## 1.03 REFERENCES

- A. NEMA AB1 - Molded Case Circuit Breakers.
- B. NEMA MG1 - Motors and Generators.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. ANSI/NFPA 70 - National Electric Code.
- E. NFPA 110 - Emergency Standby Systems.
- F. NFPA 30 - Flammable and Combustible Liquids Code.
- G. NFPA 37 - Installation of Stationary Engines.
- H. NFPA 101 - Life Safety Code.

## 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.
- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, radiator and derating schedules, operating performance, exhaust flow data, and cooling system data. Submit generator alternator output curves, deration curves and temperature data on the complete genset individual components.
- D. Test Reports: Indicate results of performance testing including 0.8 power factor test at 100 percent load.
- E. Prototype Test Reports: Submittals will not be received without submission of prototype test reports. No exceptions.

- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product. Provide typical system interconnection wiring diagrams.
- G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- H. Manufacturer's Field Reports: Indicate procedures and findings.

#### 1.05 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include instructions for normal operation.
- B. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

#### 1.06 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 110.

#### 1.07 1.07 - QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years experience, and with an authorized distributor offering 24-hour parts and service availability within 50 miles of the project. The manufacturer shall fabricate the engines, generators and control panel. Automatic transfer switches and generator enclosures shall be supplied, warranted and serviced by a single system source supplier.
- B. Supplier: Authorized distributor of specified manufacturer with minimum six years documented experience with specified products and factory-trained service technicians. The supplier must be factory authorized to perform warranty service on the entire system, including but not limited to, the engines, generators, control panels and automatic transfer switches. The supplier must show proof of factory trained service technicians on all components.
- C. The complete engine generator system shall be standard of a single manufacturer. It shall be factory built, tested and shipped by this single manufacturer.

#### 1.08 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 and NFPA 110.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

#### 1.09 EXTRA SERVICES

- A. The single source supplier shall provide as part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. This warranty shall cover the generator system and transfer switches. Agreement shall include, as a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished, and may not be subcontracted. The following services shall be performed once a year.
  - 1. Replace engine-lubricating oil and remove used oil from premises.
  - 2. Replace oil and fuel filters.

3. Check coolant system for proper levels and condition. Replace coolant filters and add corrosion inhibitor as needed.
4. Check air filter.
5. Check and clean crankcase breathers.
6. Check turbocharger free-spin and end play.
7. Check and adjust belts as required.
8. Check engine for loose, bare or broken wiring. Replace as needed.
9. Check entire equipment for fuel or water leaks.
10. Check condition of batteries and report any action necessary for recharging or replacing.
11. Start and run all engines, check temperatures and pressures.
12. Test engine safety shutdown systems.
13. Test all transfer switches operation and time delays.
14. Submit a report of this inspection to the Owner and advise of any further work required.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. ONAN CORPORATION, Minneapolis, Minnesota, or specifically approved equal.
- B. Proposal for any substitute equipment shall provide complete submittal data and specified herein, to the Engineer for approval or disapproval. The supplier must submit detailed sizing calculations for each generator to verify models are capable of picking up the entire loads with voltage dips as herein specified.
- C. Approval of Substitute Equipment: Design has been based on ONAN Model Generators. If substitute equipment is approved, the contractor shall be responsible for the charges of any necessary revisions to the plans and specifications, drawings, and project documentation; and charges related to equipment spacing, enclosure sizes, foundation sizes, mounts, electrical wiring, ventilation equipment, fuel, exhaust components, etc., as well as any engineering costs. Also, the supplier must furnish a list of completed installations, including name, address and telephone number of at least five comparable installations which can prove the proposed products have operated satisfactorily for three years.
- D. It is intended that all products specified herein be of standard ratings, therefore, the KW and KVA, starting KVA and maximum allowable voltage dip, ratings, etc., shall be the manufacturer's next size or rating to exactly meet the specifications. No exceptions.

### 2.02 SYSTEM REQUIREMENTS

- A. The engine generator shall start and provide continuous power to the loads with 100 percent block loading at the time of transfer.

### 2.03 NATURAL GAS ENGINE GENERATOR SET

- A. Rating: The AC engine generator set, ONAN Model C150N6 and shall be rated by the manufacturer for standby operation at 150KW/188 KVA at 0.8 PF, 60 Hz, 1800 RPM for use at 120/208 volts, 3 phase, 4 wire. Ratings shall be at an elevation of 150 feet above sea level, and at 105 degrees F.
  1. Voltage regulation shall be +/- 1.0 percent of rated voltage for any constant load between no load and rated load.
  2. Frequency regulation shall be isochronous under varying from no load to 100% rated load.
  3. Random Voltage Variation: The cyclic variations in RMS voltage shall not exceed +/- 1.0% of rated speed for constant loads from no load to rated load, with constant ambient and operating temperature.

4. Random Frequency Variation: Speed variations for constant loads from no load to rated load shall not exceed plus or minus 0.25% of rated speed, with constant ambient and operating temperature.
  5. Telephone Harmonic Distortion: The sum of AC voltage waveform harmonics, from no load to full linear load, shall not exceed 5% of rated voltage (L-N, L-L, L-L-L) and no single harmonic shall exceed 3% of rated voltage.
  6. Telephone Influence Factor: TIF shall be less than 50 per NEMA MG1-22.43.
  7. The natural engine generator set shall be capable of picking up 100% of nameplate KW and power factor in one step with the engine generator set at operating temperature, in accordance with NFPA Standard 110, Paragraph 5-13.2.6.
  8. The maximum allowable engine BMEP on the engine shall not exceed 224 psi at 100% rated load.
  9. The engine generator shall start and provide power to the loads in the following step starting sequence with a maximum instantaneous voltage dip of 30% and a maximum frequency dip of 10%.
  10. The generator shall at a minimum provide the following performance. Refer to generator load list.
- B. The alternator performance shall be designed to provide a minimum of 840 locked rotor KVA at a maximum voltage dip of 30%.
- C. The following performance verifications shall be provided for substitute generators.
1. Submit generator sizing program based upon the specified step/starting sequence and associated voltage/frequency dips and required starting KVA.
  2. As part of the substitution requirements the contractor shall enter all design step/starting sequence loads into the manufacturer's generator sizing program to verify model proposed by substitute manufacturer meets the specified requirements for ambient temperature, site altitude, voltage dip, frequency dip, and starting KVA. Contractor shall provide generator sizing program to engineer for review and approval.

#### 2.04 AC GENERATOR, REGULATOR AND EXCITER UNIT

- A. The AC generator, exciter and voltage regulator shall be designed and manufactured by the engine generator set manufacturer as a complete generator system.
- B. The AC generator shall be synchronous, four pole, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan and directly connected to the engine with flexible drive discs. The armature shall have skewed laminations of insulated electrical grade steel, two-thirds pitch windings in order to minimize field heating and voltage harmonics. The rotors shall have amortisseur (damper windings) layer wound mechanically wedged winding construction. The rotors shall be dynamically balanced. The exciters shall be brush-less, three phase, with full wave silicon diodes mounted on the rotating shaft and a surge suppressor connected in parallel with the field winding. Field discharge resistors shall not be acceptable. Systems using three wire solid state devices (such as SCRs or transistors) mounted on the rotor shaft shall not be acceptable.
- C. All insulation system components shall meet NEMA MG1 standard temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees C to provide additional allowance for internal hot spots. The main generator and exciter insulation systems must be suitably impregnated for operation in severe environments for resistance to sand, salt and sea spray.
- D. Generator shall be a Permanent Magnet Generator (PMG). Permanent magnet generators shall provide excitation power to the automatic voltage regulator for immunity from voltage distortion caused by nonlinear SCR controlled loads on the generator. The PMG's shall sustain



main field excitation power for optimum motor starting and to sustain short circuit current for selective operation and coordination of system overcurrent devices.

## 2.05 ENGINE GENERATOR SET CONTROLS

- A. The generator sets shall be provided with microprocessor-based control systems which are designed to provide automatic starting, monitoring, and control functions for the generator set. The control systems shall also be designed to allow local monitoring and control of the generator sets, and remote monitoring and control as described in this specification. The controls shall be mounted on the generator sets, and shall be vibration isolated and prototype tested to verify the durability of all components in the system under vibration conditions encountered. The controls shall be UL-508 labeled, CSA282-M1989 certified, and meet IEC-8528 part 4. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure doors shall be gasketed. There shall be no exposed points in the controls (with the door open) that operate in excess of 50 volts. The controls shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std. 801.2, 801.3 and 801.5 for susceptibility, conducted and radiated electromagnetic emissions. The entire controls shall be tested and meet the requirements of IEEE587 for voltage surge resistance. The generator set mounted controls shall include the following features and functions:
1. Three position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
  2. Red "mushroom-head" push-button EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
  3. Push-button RESET Switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
  4. Generator Set AC Output Metering: The generator set shall be provided with a metering set with the following features and functions:
    - a. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.
  5. Generator Set Alarm and Status Message Display: The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel:
    - a. Low Oil Pressure (alarm)
    - b. Low Oil Pressure (shutdown)
    - c. Oil Pressure Sender Failure (alarm)
    - d. Low Coolant Temperature (alarm)
    - e. High Coolant Temperature (alarm)
    - f. High Coolant Temperature (shutdown)
    - g. Engine Temperature Sender Failure (alarm)
    - h. Fail to Crank (shutdown)
    - i. Overcrank (shutdown)
    - j. Overspeed (shutdown)
    - k. Low DC Voltage (alarm)
    - l. Low Coolant Level (alarm or shutdown-selectable)
    - m. High DC Voltage (alarm)
    - n. Weak Battery (alarm)

- o. Low Fuel-Daytank (alarm)
  - p. High AC Voltage (shutdown)
  - q. Low AC Voltage (shutdown)
  - r. Under Frequency (shutdown)
  - s. Over Current (warning)
  - t. Over Current (shutdown)
  - u. Short Circuit (shutdown)
  - v. Ground Fault (alarm)
  - w. Over Load (alarm)
  - x. Emergency Stop (shutdown)
  - y. In addition, provisions shall be made for indication of two customer-specified or future alarm or shutdown conditions. These two alarm conditions shall be interfaced with leak detection/overfill alarm panel for overfill and leak detection. Labeling of the customer specified or future alarm or shutdown conditions shall be of the same type and quality as the above specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate the generator set is not able to automatically respond to a command to start from a remote location.
6. Engine Status Monitoring: The following information shall be available from a digital status panel on the generator set control:
- a. Engine Oil Pressure (psi or kPa)
  - b. Engine Coolant Temperature for left and right block temperatures (degrees F or C; both)
  - c. Engine Oil Temperature (degrees F or C)
  - d. Engine Speed (rpm)
  - e. Number of Hours of Operation (hours)
  - f. Number of Start Attempts
  - g. Battery Voltage (DC volts)
7. Control Functions: The control system shall provide for the following functions:
- a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, reset time, and number of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
  - b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
  - c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
  - d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
  - e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure condition.
8. Alternator Control Functions: The generator set control shall include the following alternator control functions:
- a. The generator set shall include an automatic voltage regulation system which is matched and prototype tested with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control build up of AC generator voltage to provide a linear rise and limit overshoot. The systems shall include a torque-matched characteristic, which shall reduce output voltage in

- proportion to frequency below a threshold of [58-59] HZ. The voltage regulator shall include adjustments for gain, damping and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alpha-numeric LED readout to indicate setting level.
- b. The voltage regulation system shall include provisions for reactive load sharing and electronic voltage matching for paralleling applications. Motorized voltage adjust pot is not acceptable for voltage matching.
  - c. Controls shall be provided to monitor the output current of the generator set and initiate an alarm when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator.
  - d. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition when total load on the generator set exceeds the generator set rating for in excess of 5 seconds.
  - e. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
  - f. An AC over/under voltage monitoring system which responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
  - g. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32VDC. During engine starting, the low voltage limit shall be disabled, and if DC voltage drops to less than 14.4 volts for more than two seconds a "weak battery" alarm shall be initiated.
  - h. The control system shall include a ground fault monitoring relay. The relay shall be adjustable from 100-1200 amps, and include adjustable time delay of 0-1.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay which will function correctly in system as installed.
9. Control Interfaces for Remote Monitoring: All control and interconnection points from the generator set to remote components shall be brought to a separate connection box. No field connections shall be made in the control enclosure or in the AC power output enclosure. Provide the following features in the control system:
- a. Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
  - b. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
  - c. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
  - d. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
  - e. The control shall be provided with provisions for connection of remote monitoring equipment as described herein or shown on the drawings.

## 2.06 ENGINES

- A. The natural gas engine shall be manufactured by Cummins Engine Company and designed specifically for generator set duty. The natural engine shall be 4 cycle, natural gas fueled, direct injection, 1800 RPM, with forged steel crankshaft and connecting rods. Minimum engines shall be 543 cubic inches. Engines shall have a minimum of 6 cylinders. The cylinder blocks shall

be cast iron with replaceable wet liners and have four valves per cylinder. The engines shall be turbocharged and aftercooled.

- B. Two cycle engines will not be acceptable.
- C. Electronic governor systems shall provide automatic isochronous frequency regulation. The engine governing systems shall not utilize any exposed operating linkage.
- D. The engines shall be cooled by a unit-mounted closed loop radiator system including belt-driven pusher fan, coolant pump and thermostat temperature control. The cooling systems shall be rated for full rated load operation in 104 degrees F (40 degrees C) ambient condition. The cooling capability of the generator sets shall be demonstrated by prototype tests on a representative generator set model conducted by the generator set manufacturer; calculated data from the radiator manufacturer only is not sufficient. Radiators shall be provided with a duct adapter flange permitting the attachment of an air discharge duct to direct the radiator air outside according to the manufacturer's instructions.
- E. Rotating parts shall be guarded against accidental contact per OSHA requirements.
- F. The maximum radiator cooling air shall not exceed 8,800 scfm. The maximum allowable static restriction shall not exceed 0.5 inches of water. The entire cooling air system is based on the above data. All costs incurred if an alternate manufacturer is purchased shall be the responsibility of the electrical contractor. These costs shall include costs to all other trades as well as any associated engineering fees.

## 2.07 ENGINE ACCESSORY EQUIPMENT

- A. The engine generator sets shall include the following accessories:
  - 1. Electric starters capable of three complete cranking attempts without overheating, before overcrank shutdown (75 seconds).
  - 2. Positive displacement, mechanical, full pressure, lubrication oil pumps. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicators. Provide bypass oil filters.
  - 3. Replaceable heavy duty dry element air cleaners with restriction indicators and safety element.
  - 4. Engine mounted battery charging alternators, 100 ampere and solid-state voltage regulators.
  - 5. Anti-condensation heater for alternator.

## 2.08 BASES

- A. The engine-generator set shall be mounted on a heavy duty steel base to maintain proper alignment between components. The engine-generator set shall incorporate battery trays with battery holddown clamps on the base rails. Provisions for stub up of electrical connections shall be within the footprint of the generator set base rails and within the basetanks as specified in the housing section of the specification. Vibration isolators, spring type, shall be provided to be mounted under the generator set base.

## 2.09 GENERATOR SETS CIRCUIT BREAKERS

- A. Generator main circuit breaker shall be solid state UL listed, molded case type, rated as listed below. Circuit breakers shall be mounted in a separate NEMA 1 enclosure and be shipped completely wired to the gensets. No exceptions. Enclosures shall include neutral blocks for field connection.
- B. Solid State circuit breakers shall be 100% rated: Refer to drawings for sizes.

- C. Circuit breaker (CB) shall be long time current and instantaneous pickup with solid state trip unit. CB shall have visible mechanical fault indicator and push button trip.
- D. Circuit breakers shall be rated at 65,000 AIC.
- E. Provide auxiliary contacts on breaker position.

## 2.10 EXHAUST SYSTEMS

- A. One exhaust silencer shall be provided for the generator set. The silencer shall be super critical grade. The silencer shall reduce total noise a minimum of 71.3 dB(A) at twenty-three feet.
- B. The exhaust silencer shall be bottom inlet/top outlet and shall be mounted inside the sound attenuated enclosure. Provide all fittings, reducers, couplings elbows and spool pieces.
- C. All exterior fittings, accessories and bolts shall be type 304 stainless steel. Provide heat resistant gaskets between all flanged connections to serve as dielectric protectors.
- D. The maximum gas flow shall not exceed 1,431 cfm (at full stand by). The exhaust gas temperature shall not exceed 1186 degrees F (at full stand by). The maximum back pressure shall not exceed 36.1 inches of water. The design of the entire exhaust system is based on the above data. If a substitution of model specified is made, all costs incurred to redesign as well as costs to other trades to modify the layout shall be the complete responsibility of the electrical contractor.
- E. Provide stainless steel flexible exhaust connections for the engine as required for connection between the engine exhaust manifolds and exhaust lines in compliance with applicable codes and standards.
- F. Provide an exhaust system condensation trap with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from entering the engine.
- G. Provide a suitable weather cap at the stack outlet with all necessary flanges and fittings for proper installation. The weather cap shall have the proper counter weights attached to prevent banging while generator is unloaded.
- H. Thermal jacket for interior exhaust lines and silencer by FIRWIN CORP. or engineered approved equal. Jacket thickness shall be sufficient to maintain a surface temperature of less than 200 degrees F.
- I. Exhaust mufflers shall be installed by enclosure manufacturer so their weight is not supported by the engines.

## 2.11 ACCESSORIES

- A. Vibration isolators: Spring type.
- B. Starting and control Batteries: Two (2) 24 volt starting batteries each genset, lead acid type, 24 volt DC (12 volt DC will not be accepted), sized to accommodate 45 seconds of cranking at an ambient of 0 degrees F without being recharged.
- C. Battery Chargers: One 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of :

1. Loss of AC Power - red light.
  2. Low Battery Voltage - red light.
  3. High Battery Voltage - red light.
  4. Power ON - green light (no relay contact).
- D. Block Heaters: Thermostatically controlled jacket water heater shall be supplied for each genset with a minimum size shall be 4990 watts. Input voltage of heaters shall be 480 VAC 1 phase.
- E. Provide generator 20 light remote annunciator located inside the Electrical Room (ATS Room) on the ATS Cubicle. Interface generator set controls with battery charger and fuel tank alarms for all status conditions. Provide all power, control wiring including conduits.

## 2.12 ENCLOSURE

- A. The generator set shall be provided with a factory-installed sound attenuated housing which allows the generator set to operate at full rated load in the ambient conditions previously specified. The enclosure shall reduce the sound level of the generator set while operating at full rate load to a maximum of 71.3 dBA at any location 7 meters from the generator set in a free field environment. Housing materials used shall be steel. Fiberglass and plastic are not acceptable. Acoustical materials used shall be oil and water resistant. No foam materials shall be used.
- B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment and a hinged rear see-through control door. Key-locking and padlockable door latches shall be provided for all doors. Door hinges shall be stainless steel.
- C. The enclosure shall be provided with an exhaust silencer which is mounted on top of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a rain cap and rain shield.
- D. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. Metal part surfaces shall be prepared, primed and painted. The painting process shall result in a coating which meets the following requirements:
1. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
  2. Gloss, per ASTM D523, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
  3. Crosshatch adhesion, per ASTM D3359, 4B-5B.
  4. Impact resistance, per ASTM D2794, 120-160 inch pounds.
  5. Salt spray, per ASTM B117, 1000+ hours.
  6. Humidity, per ASTM D2247, 1000+ hours.
  7. Water Soak, per ASTM D2247, 1000+ hours.
- E. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts will not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work. The enclosure shall be built and tested by the engine generator manufacturer.

## 2.13 SOURCE QUALITY CONTROL

- A. To provide proven reliability of the system, three series of tests shall be performed: prototype model tests, production model tests and field tests. The manufacturer shall provide documentation demonstrating satisfactory prototype and production test results. Generator sets that have not been prototype tested and factory tested at 0.8 PF will not be acceptable.

- B. Generator Set Factory Production Tests and Evaluation: These tests and evaluations must have been performed on a prototype generator set representative of the Model specified. A summary of the generator set testing results shall be submitted for review. The manufacturer's standard series of components development tests on the generator system, engine and other major components shall also be performed and available for review, but shall not be acceptable as a substitute for prototype testing on the complete representative generator set prototype.
- C. Torsiograph Analysis and Test: The manufacturer of the generator set shall verify that the engine generator set, as configured, is free from harmful torsional stresses. The analysis shall include correlation of empirical data from tests on a representative prototype. The empirical data must include spectrum analysis of the torsional transducer output within the operating speed range of the engine generator set. Calculations based on engine and generator separately are not acceptable.
- D. Temperature Rise Test: Complete thermal evaluation of a prototype generator rotor and starter must include actual measurement of internal generator and exciter temperatures by embedded detector method, and measurement of average temperature rise by resistance method. No position measured any place in the windings may exceed the temperature rise limits of NEMA for the particular type of insulation system used. Resistance method temperature rise data shall be confirmed by a full load test on the generator set prototype to include conducted and radiated heat from the engine.
- E. Short Circuit Test: A test on a prototype generator set shall have demonstrated that the generator set is designed to withstand the mechanical forces associated with a short circuit condition. With the generator set operating at rated load and speed, the generator terminals must be short circuited on all three phases for a duration of 20 seconds. At the conclusion of this test, the generator set must be capable of full load operation.
- F. Endurance Run Test: A minimum of 500 continuous hours of endurance testing with a representative generator set prototype operating as defined by the manufacturer's standby rating shall have been performed. Endurance testing shall be used to verify structural soundness and durability.
- G. Maximum Power Test: With the prototype generator set at normal operating temperature and with all power consuming auxiliaries in place, the maximum power available at rated speed shall be determined with the governor set at its fuel stop. The generator set shall maintain this power for a minimum of two minutes.
- H. Linear Vibration Test: A test for in-line motion of components occurring along a repeatable path shall meet the manufacturer's acceptance criteria.
- I. Cooling System Test: A cooling system test shall demonstrate the ability of the generator set cooling system to maintain normal operating temperature while operating at full rated load and power factor at the highest ambient temperature (122°F) of the system rating. Cooling air requirements, radiator air flow and maximum allowable restriction at radiator discharge, shall be verified by this test.
- J. Maximum Motor Starting KVA: Motor starting KVA shall be determined by test, based on a sustained RMS recovery voltage of at least 90 percent of no load voltage with the specified load KVA at near zero power factor applied to the generator set.
- K. Transient Response, Steady State Speed Control and Voltage Regulation: Prototype generator set tests shall demonstrate consistent performance as follows; stable voltage and frequency at all loads from no load to full rated load, consistent frequency bandwidth with steady state load, maximum voltage and frequency kp on load acceptance and rejection and restoration to steady state after sudden load changes. Transient response is a complete generator set (engine,

generator, exciter, and regulator) performance criteria and cannot be established on generator data alone.

- L. Witnessed Generator Set Factory Production Tests: On the equipment to be shipped, an 8-hour test shall be performed at rated load and 0.8 PF. These tests shall include certified data to document the following: run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup and safety shutdowns. Provide a factory certified test record of the production testing. Certified test record shall be sealed by a licensed professional engineer.

## 2.14 WARRANTY

- A. Provide a 5-year manufacturer's limited warranty, including 100% parts and labor. The complete electrical power system, including but not limited to, generator set, controls, associated switches, enclosures, and accessories, as provided by the single source manufacturer, shall be warranted by the manufacturer against defects in materials and workmanship for a period of five (5) years from the date of system startup. Coverage shall include parts, labor, travel expenses, and labor to remove/reinstall the equipment, as standard published limited warranty. Supplier must be factory authorized to perform warranty service on the entire system, including, but not limited to, the engine, the generator, the control panels, and the automatic transfer switches.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install engine generator and all appurtenances in accordance with manufacturer's recommendations.
- B. Enclosure manufacturer shall install all exhaust components as shown on the drawings and as required to comply with NFPA 37 and local codes and regulations. Components shall be sized to assure full load operation without excessive backpressure sized as per manufacturer's recommendations with actual site dimensions when installed as shown on the drawing. Make provisions as required for pipe expansion and contraction.
- C. Coordinate installation of anchor bolts with generator enclosure manufacturer.
- D. Installation shall comply with applicable State and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

### 3.02 FIELD QUALITY CONTROL

- A. Initial startup and field acceptance tests are to be conducted by the authorized rep-representative of the system manufacturer who supplies the equipment.
- B. Test data shall be collected and recorded on the following: time of day, coolant temperature, operating oil pressure, battery charging rate, cranking time, crank-to-rated frequency time, voltage and frequency overshoot, load assumption-to-steady state voltage and frequency stabilization time, operating voltage, frequency, current, kilowatts and power factor. All data shall be taken every fifteen (15) minutes.



- C. Procedure: Generator manufacturer shall conduct a six (6) hour load bank test at 1.0 power factor for each generator set. Contractor shall provide load bank for testing generator set at 100% load. Contractor is not permitted to use load bank specified as part of the testing requirements. Load bank test shall test generator at full nameplate KW rating. Generator manufacturer's representative shall record test data, as described in (B) above. Test data shall be tabulated and typed for submission and approval by the engineer for final acceptance. No handwritten field notes will be allowed.

**END OF SECTION 263214.11**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Interior and exterior luminaries and accessories.
- B. Emergency lighting and units.

## 1.02 REFERENCES

- A. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.
- B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
- C. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).
- D. NEMA WD 6 - Wiring Devices - Dimensional Requirements.
- E. NFPA 70 - National Electric Code.
- F. NFPA 101 - Life Safety Code.
- G. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
- H. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources

## 1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, performance data and installation instructions.
- D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.
- E. All foot candle calculations and photometrics must be provided with substitute products. Photometrics shall include a room by room analysis showing walls, room names and room numbers. Calculation points shall be 2 feet on center, measured at 30" above the floor. Maintained foot candle levels shall meet or exceed those listed in Section 2.03B of this specification. On each drawing, provide a table showing the Room Name, Room Number, Maximum Light Level, Minimum Light Level, Average Light Level, Min:Max Ratio and, IES File Model Number.
- F. All substitute LED light fixtures and LED retrofit lighting kits must be Design Lights Consortium (DLC) qualified.
- G. All substitute LED replacement lamps must be listed by Energy Star as Certified Light Bulbs.

## 1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

## 1.05 EXTRA PRODUCTS

- A. Section 017800 - Closeout Submittals.
- B. LED Fixtures: At completion of installation, deliver to Owner.
  - 1. 5 % of additional fixtures for each type specified listed on the light fixture schedule.  
Minimum of one (1) fixture of each type.

## PART 2 - PRODUCTS

## 2.01 LIGHTING UNITS

- A. Refer to lighting fixture schedule on drawings for fixture manufacturer, catalog number, and fixture description.
- B. Provide electronic energy saving ballasts. Where dimming is shown on drawings, provide dimmable type ballasts.
- C. Incandescent and high intensity discharge recessed lighting fixtures are to be furnished with thermal cut outs as required by NEC.
- D. All fixtures equipped with emergency battery packs shall have test light and switch accessible and visible from the room floor.

## 2.02 LIGHTING FIXTURE NOTES

- A. MOUNTING: Electrical Contractor is responsible for reviewing all mounting arrangements prior to ordering any products. Electrical Contractor is responsible for ordering all of the proper fixtures, mounting hardware and miscellaneous fasteners to complete project. Fixtures to be secured to the structure from a minimum of two points, at opposing ends of the fixture when ceiling recessed or surface mounted. Four points shall be secured where necessary for the fixture to be parallel and tight to underside of ceiling. All recessed fixtures to fit tight to ceiling to eliminate all light leaks. Trim kits, when not secured internally to fixture, shall be secured to structure at a minimum of two points.
- B. MOUNTING: Prior to submitting and ordering any light fixture, Contractor is responsible for verifying adequate mounting clearances for all light fixtures that are to be recessed into a grid type ceiling. Where new ceilings are to be installed, contractor shall coordinate with ceiling installers for exact mounting heights and required mounting spaces.
- C. FINISHES: All exposed portions (permanent or adjustable) of fixtures to be finished by the manufacturer in a finish as specified.
- D. Fixtures shall come pre-assembled and complete with all sockets (incandescent to be spring supported), lamp ends, ballasts, transformers, fixture ends, trim rings, plates, and low density mounting kits (as required) for a complete installation.
- E. LENSES:
  - 1. Fluorescent - Minimum 0.125" thick and to be virgin acrylic.

2. Low voltage - Tempered glass, to enclose lamp.
- F. LAMPS: Sylvania, Phillips or General Electric, as selected by the Electrical Contractor. Note, all lamps for one project to be furnished by the same manufacturer unless otherwise specified. At the end of the project, the Electrical Contractor shall turn over to the Owner one lamp envelope from each type installed. The Contractor shall be responsible for replacing all lamps which burn out during construction and up to ninety (90) days after Owner occupancy of the building.
- G. VOLTAGE: As noted on the lighting fixture schedule. Contractor is responsible for field verifying available voltage(s) and ordering fixtures, ballasts, and transformers accordingly.
- H. ORDERING: It is solely the responsibility of the Contractor to order fixtures, lamps, mounting brackets and accessories so that the fixtures will be installed and operating upon Owner Occupancy opening. Contractor is responsible for all delays because of his/her lack of effort to order the products in a timely manner.
- I. SHIPPING: The light fixture manufacturer shall mark the fixture type as indicated on the contract drawings and/or shop drawings on the respective carton when shipping luminaries. The Contractor shall be responsible for checking each carton immediately upon receipt for verification that fixtures are undamaged and no contents are missing. All discrepancies must be reported to shipper and manufacturer immediately; otherwise the Contractor shall be responsible for items which are lacking or damaged.

### 2.03 WARRANTY

- A. All light fixtures shall have a 5-year manufacturer's warranty. Warranty shall begin on date of substantial completion.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install fixtures in accordance with manufacturer's instructions.
- B. Mount fixtures in locations as shown on drawings and as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from drawings and schedules and furnish fixtures suitable for the exact type.
- C. Joints in fixture wiring shall be made using wire nuts, pre-insulated Scotch locks, or other approved mechanical means of connection.
- D. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of the Engineer.
- E. Surface fixtures in or on plastered or drywall ceilings shall be supported from pieces of support channel spanning across main support channels and shall not depend on ceilings for support.
- F. Coordinate fixture locations to clear diffusers, ductwork, piping, etc.
- G. Maintain integrity of enclosures on all enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.
- H. Fixtures are to fit tight against construction to eliminate light leaks.

- I. Recessed downlights are to be provided with adjustable mounting bars/frames for drywall or lay-in ceilings as required. Fixtures shall be securely fastened to the ceiling framing member by mechanical means such as bolts, screws, rivets, or listed clips identified for use with the type of ceiling framing members and fixtures.
- J. Support recessed fixtures 2 foot x 2 foot and larger using a minimum of four independent wire hangers, one on each corner, of same gauge as ceiling suspension system supported from building structure independent of ceiling framing. Install earthquake clips to secure recessed grid-suspended luminaires in place.
- K. Wall-mounted fixtures shall be mounted plumb with building lines and installed with proper box and cover hardware.
- L. Surface-mounted fixtures are to cover mounting hardware. Use a canopy that is no longer than the length and width of the fixture and at a height that is no higher than required to mount the fixture absolutely vertical. Fixtures shall be plumb and shall align with building lines and with each other. Support surface mounted luminaires on grid ceiling directly from building structure. Secure to prevent movement.
- M. Stem-mounted fixtures are to be mounted to be absolutely vertical or horizontal. Install suspended luminaires using pendants supported from swivel hangers or in accordance with details shown in drawings. Provide pendant length required to suspend luminaire at indicated height. Support stem-mounted fixtures directly from the building structure.
- N. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. In fire rated ceilings, recessed luminaires must carry one-hour UL fire rating classification.
- O. Install all accessories specified with each fixture. Install recessed luminaires to permit removal from below.
- P. Bond products and metal accessories to branch circuit equipment grounding conductor.
- Q. At completion of installation and before turning over to owner, clean and remove all dirt and smudges from all lighting fixtures including lenses, louvers and reflectors.
- R. Relamp luminaires that have failed at completion of project.

**END OF SECTION 265000**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Main CB/current transformer/meter cabinet and meter pan.
- B. Transformer to be pole mounted on utility.
- C. Primary and secondary conduits, conductors, excavation, concrete and backfill.

## 1.02 RELATED SECTIONS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.

## 1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.

## 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 013300.

## PART 2 - PRODUCTS

## 2.01 METERING EQUIPMENT

- A. Meter pans, meter, current transformers and ground fault circuit protection shall be on Local Utility's approved lists of manufacturers and models.
- B. CT Cabinets and Current Transformers shall be installed as per Local Utility specifications.

## 2.02 PULL BOXES

- A. Provide pull boxes including property line pull boxes as per Local Utility requirements for both primary and secondary services.
- B. Provide Local Utility approved type B-3-6 for secondary services 400 amperes and less.

## 2.03 CABLE

- A. Install new primary and secondary service conductors in conduit.
- B. Primary service conductors shall be 15 KV, copper size 1/0, type TR-XLPE with 220 mils insulation thickness as per Local Utility requirements.
- C. Secondary service conductors shall be copper type XHHW-2 as per Local Utility requirements.

## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. Coordinate primary and secondary service installation with Local Utility prior to beginning work.
- B. Provide secondary service to incoming service equipment, coordinate service requirements with Local Utility prior to commencing work.
- C. All metering equipment shall be installed in accordance with utility requirements.

- D. Contractor shall file application for new electrical service. Contractor shall coordinate with owner for all information related to the service application.

**END OF SECTION 267173**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Temporary electric service for construction.

## 1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.

## 1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate locations where temporary electric service will be located and routed.

## 1.04 REGULATORY REQUIREMENTS

- A. Obtain required permits from authorities.
- B. Notify affected utility companies before starting work and comply with their requirements.
- C. Do not close or obstruct egress width to exits.
- D. Do not turn off electric equipment without authorization from Owner and Engineer. Provide 72 hours advance notification.

## PART 2 - PRODUCTS

## 2.01 TEMPORARY ELECTRIC SERVICE

- A. Temporary service shall be available during the entire contract period and during all phases of work, day and night for Vails Gate FD storage building.
- B. Temporary service shall be installed and maintained per NEC, OSHA, N.Y. State Uniform Building Code and Local Utility requirements.
- C. The temporary electrical service shall be sized correctly for all of the new and existing loads.
- D. All existing equipment shall be protected against damage caused by the installation, operation and removal of the temporary service. Any equipment or items damaged shall be replaced at no cost to the Owner.
- E. Provide temporary lighting for new Vails Gate FD storage building. Minimum foot candle for temporary lighting: 30 F.C., measured at floor surface. The Contractor shall set up light to minimize glare.
- F. Provide wiring, utility poles, metering equipment, distribution panel and other equipment for temporary light and power to construction trailer. Contractor shall pay all fees required for temporary service and complete all required applications. Contractor shall pay all application and construction fees required for temporary service and complete all required applications. Contractor shall pay for all electrical consumption for temporary service.
- G. Provide Owner with three (3) keys to all distribution panels for temporary power for distribution to General Contractor and District Personnel.



- H. Wiring for temporary light, controls and power shall include a distribution panel for 120/208V, 3 Phase, 4 wire, 200 Amp. Feeders in building shall have branch circuits of #12 conductors minimum. Contractor shall pay all application and construction fees required for temporary service and complete all required applications
- I. Provide 20 amp branch circuits with fused ground type receptacle outlet for single phase power.
- J. Where distribution panels are provided for temporary power provide four (4) 20 amp circuits with #12 AWG SO cord pigtails with 20 amp plugs with strain relief. Provide one (1) 30 amp circuit with #10 AWG SO cord pigtail with 30 amp plug with strain relief.
- K. Provide lamps and fuses, including replacements required.
- L. Provide new materials for temporary light and power.
- M. Provide ground fault protection (such as portable plug-in type ground fault circuit interrupters) on single phase 20 amp receptacle outlets.
- N. Provide receptacle outlets, portable cord connectors and attachment plugs with standard NEMA configurations.
- O. Install all temporary light and power materials in accordance with National Electrical Code.
- P. Upon completion of the project, remove all temporary electric light and power work and restore all affected finishes, connections and sitework.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing system voltage characteristics and match to existing system voltage characteristics.
- B. Verify that the temporary service is sized to accommodate all loads.
- C. Determine locations and routings for temporary electric wires, cables and conduits with Engineer and Owner.

#### 3.02 TEMPORARY POWER

- A. Temporary wiring and power shall be installed so as not to be a hazard and shall be protected from damage. Separate circuits shall be provided for light and power. Over-current protective devices and switches shall be provided. All equipment, tools, metal cabinets and boxes shall be grounded.
- B. Disable existing power only to make final connections or when new service is to be installed.
- C. Remove and dispose of all temporary power and control feeds after receiving written approval from Engineer. Restore all finishes to original specified conditions.

### END OF SECTION 267174

## PART 1 -GENERAL

## 1.01 SECTION INCLUDES

- A. Fire Alarm Control Panels (FACP).
- B. Remote Annunciator.
- C. Addressable Manual Fire Alarm Stations.
- D. Addressable Smoke Detectors.
- E. Addressable Duct Mounted Smoke Detectors.
- F. Remote for Smoke Alarms.
- G. Addressable Heat Sensor.
- H. Audio/Visuals
- I. Visual Devices
- J. Pull Stations
- K. Carbon Monoxide Detector with Sounder Base

## 1.02 RELATED SECTIONS

- A. Section 260535 - Conduit.

## 1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 72, 72G, 72H - National Fire Alarm Code.
- C. NFPA 101 - Life safety code.

## 1.04 WORK INCLUDED

- A. Furnish and install as described in these specifications and as indicated on the drawings, fire alarm and smoke detection equipment with battery backup.
  - 1. All equipment shall be UL listed under category UOJZ as an integrated control system; equipment listed under category UOXX as a control unit accessory shall not be acceptable. The installation shall meet the applicable requirements of NFPA 72 and New York State Code, as well as those standards set by the authorities having jurisdiction (Nassau County Fire Marshal).
  - 2. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component. The catalog numbers specified under this section constitute the type, product quality, material and desired operating features.
  - 3. Provide all labor, materials and services to perform all operations required for the complete installation and related work shown on the drawings and as specified herein.
  - 4. All electrical work and equipment shall meet the requirements of NFPA 70 and 72.

## 1.05 SUBMITTALS

- A. Submit product data as required by Section 013300.
  - 1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
  - 2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
  - 3. Equivalent equipment (compatible UL-Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met, and upon approval of the Architect/Engineer.
- B. Shop drawings:
  - 1. Provide a list (bill of materials) of all types of equipment and components provided.
  - 2. Provide annunciator layout and system wiring diagram showing each device and wiring connection required, including existing equipment. Provide a description of operation of the system. Provide system ampere load and time calculations to substantiate compliance with battery back up power requirements.
  - 3. Sufficient information, clearly presented shall be included to determine compliance with drawings and specifications.
  - 4. Include manufacturer's printed product data with name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
- C. Manuals:
  - 1. Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturers name(s) including technical data sheets.
  - 2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
  - 3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
  - 4. Indicate application conditions and limitations of use stipulated by product testing agency.
  - 5. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products
- D. Test Reports and Certifications:
  - 1. Indicate satisfactory completion of required tests and inspections.
  - 2. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.
- E. Contractor shall provide Engineer with a complete set of drawings, signed and sealed by a New York State Professional Engineer, (including all floors, crawl spaces, closets, open spaces) showing a complete survey of all new fire equipment devices and appliances prior to submission to Local Fire Marshal. Contractor shall provide Engineer with a complete list of all HVAC equipment, including their associated CFM ratings and all associated duct smoke detectors. Upon approval from Engineer, Contractor shall submit complete package, with New York professional engineer's stamp, to Local Fire Marshal as per local requirements. The Contractor shall have a licensed New York State Professional Engineer stamp all drawings and applications. Pay for all fees to obtain permits and approval.

## 1.06 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.

- B. Record actual locations of initiating devices, signaling appliances, and end-of-line devices, including those that are existing.

#### 1.07 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 017839.
- B. Maintenance and testing shall be on a semiannual basis or as required by the Authority Having Jurisdiction (AHJ). A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventative maintenance. The schedule shall include:
  - 1. Systematic examination, adjustments and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays and all accessories of the fire alarm system.
  - 2. Each circuit in the fire alarm system shall be tested semiannually.
  - 3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

#### 1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum ten (10) years documented experience, and with service facilities within fifty (50) miles of project location.
- B. Installer: Company specializing in installing the products specified in this section with minimum three (3) years documented experience, and certified by the State of New York as fire alarm installer.

#### 1.09 EXTRA MATERIALS

- A. Furnish under provisions of Section 017839.
- B. Provide twenty (20) of each type of automatic smoke detector.
- C. Provide twenty (20) of each type of automatic heat detector.
- D. Provide twenty (20) of each type of notification appliance.
- E. Provide twenty (20) of each type of pull station.
- F. Provide twenty (20) of each type of carbon monoxide detector.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. EDWARDS SYSTEM TECHNOLOGY (EST)
- B. APPROVED EQUAL.

#### 2.02 GENERAL

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protected premises protective signaling (fire alarm) system.

- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning equipment installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

### 2.03 CONDUIT AND WIRE

- A. Conduit:
  - 1. Conduit shall be in accordance with the National Electric Code (NEC), local and state requirements.
  - 2. All wiring shall be installed using plenum rated cable except for boiler, mechanical and electrical rooms and any other rooms with open ceilings.
  - 3. Cable must be separated from any open conductors, as per NEC Article 760-29.
  - 4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals
  - 5. Conduit shall enter the Fire Alarm Control Panel, Remote Annunciator Panel and/or backboxes where conduit entry is designated and permitted by the FACP manufacturer.
  - 6. Conduit shall be ¾ inch (19.1 mm) minimum.
- B. Wire:
  - 1. All fire alarm system wiring shall be new.
  - 2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760), and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and not less than 14 AWG (1.63mm) for Notification Appliance Circuits. All wiring shall be of the type recommended by the manufacturer.
  - 3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
  - 4. All wire and cable shall have a fire resistance rating suitable for the installation as indicated in NFPA 70, and shall test free from grounds or crosses between conductors.
  - 5. Wiring used for the multiplex communication loop shall be twisted and shielded and installed in conduit unless specifically excepted by the fire alarm equipment manufacturer. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop
  - 6. All field wiring shall be completely supervised.
- C. Terminal Boxes, Junction Boxes and Cabinets:
  - 1. All boxes and cabinets shall be UL listed for their use and purpose.
- D. Circuits shall be arranged to serve like categories (manual, smoke, horn, strobe). Mixed category circuitry shall not be permitted except on signaling line circuits connected to addressable reporting devices.

### 2.04 SEQUENCE OF OPERATIONS

- A. Basic Addressing and Circuiting Guidelines
  - 1. The addressable fire alarm system shall provide an individual multiplex data address for each addressable manual fire alarm station, addressable area smoke detector,

addressable duct smoke detector, addressable heat detector, addressable carbon monoxide detector, Monitor Zone Addressable Module (MZAM), Control Zone Addressable Module (CZAM) or Signal Zone Addressable Module (SZAM). The FACP shall be able to support up to a system total of two hundred fifty four (516) individual addresses.

2. The FACP shall provide NFPA Standard 72A, Style 4 (Class B, two wire) addressable data communications circuits (MAPNET) to provide connection of and communication with the addressable devices, as required by these Specifications and/or as shown on the Drawings. Each addressable data communications circuit (MAPNET) shall provide the capability of communicating with up to one hundred twenty-seven (127) addressable devices.

B. Fire Alarm System Sequence of Operation

1. The FACP central processing unit (CPU) shall provide for the monitoring of addressable, smoke sensors. Each smoke sensor shall be individually monitored for its normal output voltage level, which is a function of accumulating environmental factors such as dirt and dust. The normal output voltage level shall be digitized and transmitted to the FACP CPU every four (4) seconds. The FACP CPU shall maintain a moving average of these normal voltage outputs in an individual sensor average file. When smoke enters the sensor, the output voltage rises in direct proportion to the density of the smoke and the alarm condition of each smoke sensor is determined at the FACP CPU by comparing the current actual value with the sensor's normal average value combined with the alarm threshold programmed for that sensor. The alarm threshold may be individually programmed for each smoke sensor as a sensitivity percentage (0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 3.0% and 3.7%) above its normal average value. The sensitivity percentage for each sensor may also be programmed to change as a function of the time of day and day of week. When an individual sensor's normal average value rises to a fixed, preset level due to excess accumulation of dirt and dust, a system trouble condition shall be generated and a "sensor dirty" message shall be displayed, for that sensor, on the FACP LCD display and entered into the system historical trouble log. If the sensor is not cleaned and further accumulation occurs that would degrade proper sensor operation, a second system trouble condition shall be generated and a "sensor excessively dirty" message shall be displayed and entered into the system historical trouble log.
2. Operation of any manual fire alarm station or activation of any smoke sensor (during the alarm verification sequence, if so programmed), area smoke detector (during the alarm verification sequence, if so programmed), duct smoke detector, heat detector or sprinkler waterflow switch shall automatically:
  - a. Sound all horns throughout the building with an individual Temporal Code. The alarm signals may be silenced during the alarm condition by operation of the FACP alarm silence switch. Subsequent alarm conditions shall resound the alarm horns.
  - b. Flash all alarm strobe lights throughout the building. The alarm strobe lights shall be turned off when the system is reset.
  - c. Display a general alarm indication and system status summary (numbers of alarm, supervisory and/or trouble conditions) on the FACP liquid crystal display (LCD). Pressing the alarm acknowledge key shall display, for thirty (30) seconds, the individual device or circuit display, to include the "alarm" status and custom label (up to forty characters and spaces) for the addressable device or circuit of alarm initiation on the liquid crystal display (LCD). At the end of the thirty (30) second period, the general alarm indication and system status summary shall again be displayed. The individual device/circuit display may be recalled at any time by repressing the alarm acknowledge key or until the alarm condition is reset to normal.
  - d. Enter the alarm condition custom label with time and date of occurrence into the FACP historical alarm log for future recall.
  - e. Shutdown all fans over 1000 CFM.
  - f. Activate circuit for to initiate alarm to central station. The Central station communicator and central station shall be furnished by owner.

## 2.05 MAIN FIRE ALARM CONTROL PANEL

- A. The fire alarm system control panel(s) shall be Edwards System Technology model iO1000 and comply with UL 864, "Control Units for Fire- Protective Signaling Systems."
- B. The following FACP hardware shall be provided:
  - 1. Power Limited base panel with beige cabinet and door, 20 VAC input power.
  - 2. 2,000 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
  - 3. 2000 points of annunciation where one (1) point of annunciation equals:
    - a. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
    - b. 1 LED on panel or 1 switch on panel.
    - c. Provide battery voltage and ammeter readouts from the LCD Display.
    - d. Municipal City Circuit Connection with disconnect switch. 24VDC Remote Station (reverse polarity) local energy, shunt master box, or a form "C" contact output.
    - e. One Auxiliary Electronically resettable fused 2A @ 24VDC Output, programmable disconnect operation for 4-wire detector reset door release auxiliary use.
    - f. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay either as normally energized or re-energized or as an auxiliary control.
    - g. Three (3) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC: rated 3A @ 24VDC, resistive).
    - h. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A 24VDC, resistive), operation is programmable for trouble alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC inductive.
    - i. The FACP shall support five (5) RS-232-C ports and one service port.
    - j. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
    - k. Common Event DACT or Point Reporting DACT.
    - l. Service Port Modem for dial in passcode access to all fire control panel information.
- C. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.
- D. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.
- E. Addressable Interface Module The addressable interface module(s) shall provide one (1) addressable data communications circuit (MAPNET) to enable the FACP to communicate with the addressable devices. Each addressable data communications circuit shall provide NFPA Standard 72A, Style 4 (Class B, two wire) supervised operation. Addressable data communications circuit wiring shall be supervised for opens in the circuit, shorts across the pair and ground faults. An addressable data communications circuit fault shall initiate a system trouble display and audible trouble signal at the FACP. Faults on one addressable data communication circuit shall not impede operation of other circuits. The module shall be readily disconnected for ease of servicing and shall be placement supervised by the Master Controller Module.

## 2.06 PERIPHERAL DEVICES

- A. Shall be EST Model SIGA-270 Series Addressable manual pull station. Red LEXAN or metal, and finished in red with molded raised letter operating instructions of contrasting color. Station

will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

- B. Lexan Protective Shield shall be STI Stopper II with tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. when shield is lifted to gain access to the station. a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery. All manual pull stations in public areas shall be provided with protective shield.

## 2.07 SMOKE SENSORS

- A. Shall be EST Model SIGA2PS Intelligent Photoelectric Detector and comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems," Include the following features:
  - 1. Operating Voltage: 24 VDC, nominal,
  - 2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation,
  - 3. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-Locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit,
  - 4. Each sensor base shall contain LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the [detector head][sensor base] LED shall be on steady.
  - 5. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location,
  - 6. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type, Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
  - 7. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
  - 8. Addressability. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
  - 9. Removal of the sensor head for cleaning shall not require the setting of addresses.
- B. Type: Smoke sensors shall be of the photoelectric type where acceptable per manufacturer specifications ionization type sensors may be used.
- C. Carbon monoxide sensor: EST model SIGA2-PCOS, intelligent photoelectric detector with carbon monoxide sensor.
- D. Duct Smoke Detector: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.
  - 1. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C., contact rated at 7 A@ 28VDC or 10A@ 120V AC.
  - 2. Duct Housing shall provide a relay control trouble indicator Yellow LED.
  - 3. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
  - 4. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke detector.



5. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
6. Each duct detector shall have a Remote Test Station with an alarm LED and test switch. Duct Smoke Sensor housing shall be EST model SIGA-DH, photoelectric type with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Provide remote alarm led indicators SIGA-LED and/or remote test station model SD-TRK as required.
7. Duct Housing shall provide a relay control trouble indicator Yellow LED.
  - a. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
  - b. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
  - c. Duct Housing shall provide a magnetic test area and Red sensor status LED.
  - d. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct: housing front cover.
  - e. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.
  - f. All exterior duct detectors shall be provided with Weatherproof Duct Housing Enclosure.

## 2.08 HEAT SENSORS

- A. Shall be EST Model SIGA-HFS combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp: 135-deg F fixed-temperature setting except as indicated.
- B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermostat-based, rate-compensated, self- restoring and shall not be affected by thermal lag.
- C. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.
- D. Hi-Heat Sensor (rate of rise heat detector) shall be EST model SIGA-HRS. Sensor shall detect temperatures of 15°F per minute.
- E. Weather proof heat detectors. Ge Security 302-AW series. Weatherproof heat detector shall be hermetically sealed for moisture proof and dust proof installations. The weather proof heat detector shall require no special back box when the all-weather leads are properly spliced to "THW" or equivalent type wire and splices are moisture proof. Heat detectors shall be rated for indoor or outdoor use. Provide 135°F, unless otherwise noted on the plans. Weatherproof heat detectors shall include an addressable monitor module (GE SIGA-CT1) mounted within the controlled (heated/conditioned) space. Only device wiring and the actual detector shall be located in the elements.

## 2.09 ANNUNCIATION DEVICES

- A. Visible/Only Shall be EST model GIRF-UM and shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings, and provide field selectable flash intensities of 15cd, 30cd, 75cd, 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.
- B. Audible Visible shall be EST model GIRF-HDVM and shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box without the use of special adapters or trim rings.

#### 2.10 CARBON MONOXIDE DETECTOR WITH SOUNDER BASE

- A. Manufacturer: Edwards
  - 1. Model: SIGA2-COS
  - 2. Accessories: SIGA-AB4GT With SIGA-TCOR (Temporal '4' Pattern Generator)

#### 2.11 REMOTE CRTS AND PRINTERS

- A. Fire Alarm Control Unit shall be capable of operating remote CRT's and/or printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.

#### 2.12 REMOTE LCD ANNUNCIATOR

- A. Provide [1] Remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall be EST Model 3-LCDANN and use the same Primary Acknowledge, Silence and Reset Keys, Status LEDs and LCD Display as the FACP.
- B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
- C. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
- D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
  - 1. 40 character custom location label.
  - 2. Type of device (e.g smoke, pull station, water flow)
  - 3. Point status (e.g. alarm, trouble)
- F. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

#### 2.13 GRAPHIC MAP

- A. Contractor shall provide and install a weather proof map of the facility. Map shall be on 24" by 36" laminated paper. Contractor shall program descriptions for detection devices to include a location (example: room#, hallway, etc.) and closet column (example: Clmn68). Contractor shall coordinate with District for exact descriptions prior to programming. Map shall be provided with and installed in a weatherproof lockable enclosure, located adjacent to each remote annunciator and fire alarm control panel. District will provide contractor with a drawing of the facility in AutoCAD 2000 format.

## PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. No installation shall begin without approved plans from the fire marshal or AHJ.
- B. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagrams. The Contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation.
- C. All penetrations of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes.
- D. End of Line Devices (Resistors/Diodes/Capacitors): Shall be furnished as required for mounting as directed by the manufacturer.
- E. All wiring shall be color coded throughout, to National Electrical Code standards and a minimum of No. 18 AWG., unless otherwise noted. All wiring shall be of the type recommended by the manufacturer.
- F. All wires shall test free from grounds or crosses between conductors.
- G. Fire alarm system terminal and junction locations shall be identified in accordance with NFPA Standard 70, Section 760-3. Terminal and junction boxes shall be painted red and stenciled in white letters "FIRE ALARM", preventing unintentional interference with the fire alarm system wiring during testing, servicing and additional modifications to the system.
- H. The system shall be arranged to receive power from two/three-wire, 30 Ampere, 120 volt, 60 cycle alternating current supply through fused cut-out with emergency generator backup. All low voltage operation shall be provided from the FACP(s).
- I. All final connections between system equipment and the wiring shall be made under the supervision of a trained manufacturer's technical representative.
- J. The contractor shall submit to the Authority Having Jurisdiction (AHJ), all necessary drawings and equipment specifications required for a complete AHJ approved system. Drawings shall be prepared by the Contractor.
- K. The Contractor shall have a licensed New York State Professional Engineer Stamp all drawings and applications. Pay for all fees to obtain all necessary permits.
- L. All junction boxes housing relays must be labeled with P-Touch type labeler with relay point number and device it serves, i.e. (0001-Flow Switch 1).
- M. Contractor to review points list prior to programming with Owner. Contractor only to program approved points list. Any changes to program not previously approved by Owner will be done at Contractor's expense.

## 3.02 CLEAN UP

- A. Upon completion of the installation, all debris created by the installation shall be removed from the premises or disposed of as directed by the Owner.
- B. It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed

necessary by the engineer, owner or AHJ, the installing contractor shall be responsible for the clearing of all devices prior to final acceptance.

### 3.03 TESTS

- A. Prior to the final acceptance test, the Contractor and a trained manufacturer's technical representative shall test the completed system for proper operation. The system shall be demonstrated to perform all of the functions as below listed in 3.04 C. Any system, equipment or wiring failures discovered during said test shall be repaired or replaced before requesting scheduling of the final acceptance test.
- B. The system shall be tested for final acceptance in the presence of the Owner's representative, Architect's representative, Engineer's representative, the local Code enforcement official, Contractor's representative and the Manufacturer's representative.
- C. During the final acceptance test:
  - 1. Every manual fire alarm station shall be tested.
  - 2. Every smoke detector shall be tested using Simplex tester or equivalent device.
  - 3. The sprinkler system waterflow alarm switches shall be tested by flowing water. The sprinkler system valve tamper switches shall be tested by closing sprinkler valves. On dry type sprinkler systems, the air pressure shall be measured.
  - 4. Every audible alarm signaling device shall be sounded.
  - 5. Every visual alarm signaling device shall be lit or flashed.
  - 6. Every system control function shall be tested for its proper operation.
  - 7. All supervised circuits shall be opened at two (2) locations to test for proper supervision.
- D. Upon successful completion of all final acceptance tests, the Contractor's and Manufacturer's representatives shall each author and sign a letter confirming the successful completion of testing. Two (2) copies of each letter shall be forwarded to the Owner's representative, the Architect's representative, the Engineer's representative and the local Code enforcement official.
- E. All final acceptance testing shall be done at a time convenient to the local Code enforcement official and the Owner's representatives and all testing costs shall be born by the Contractor as part of this Contract.

### 3.04 DOCUMENTATION AND TRAINING

- A. The Contractor shall provide the services of a trained manufacturer's employee for a period of four (4) hours, during normal business hours, to instruct the Owner's designated personnel on the operation and maintenance of the entire system. Where multiple shifts are present Contractor to provide a four (4) hour training period for each shift, maximum of 3.

### 3.05 MAINTENANCE AND TESTING AGREEMENT

- A. The equipment manufacturer shall provide to the Owner a price quotation for a one (1) year fire alarm system maintenance and testing agreement to begin upon final acceptance of the system. System Supplier shall have a local service organization with a minimum of 20 factory trained technicians. Technicians shall be NICET Level 2 certified.

### 3.06 SERVICE AND MAINTENANCE

- A. The equipment manufacturer shall make available a fully equipped service organization, capable of guaranteeing an on-site service response time within eight (8) hours to a service request call. Said service shall be available twenty-four (24) hours per day and seven (7) days per week.

- B. The equipment manufacturer shall make available, to the Owner, a price quotation for a one (1) year maintenance and testing agreement, to take effect on the date of final acceptance

### 3.07 DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 016500.
- B. Provide instruction as required for operating the system. "Hands-on" demonstration of the operation of all system components and the entire system including program changes and functions shall be provided
- C. Demonstrate normal and abnormal modes of operation and required responses to each.
- D. The Contractor and/or the Systems Manufacturer's representative shall provide a typewritten "Sequence of Operation" to the Owner at the time of demonstration.
- E. Contractor to provide O&M manuals for the fire alarm equipment on disk format.

### 3.08 FAN SHUT DOWN

- A. The contractor shall provide fan shutdown for all equipment rated 1000 CFM or greater. All ducted equipment rated 2000 CFM or greater shall have return duct smoke detectors, remote LED indicators and fan shutdown control. All ducted equipment rated 15,000 CFM or greater shall have supply and return duct smoke detectors, remote LED indicators and fan shutdown control.
- B. All fan reset control shall be independent of fire alarm panel reset control.
- C. Provide all control modules; independent reset control modules and duct smoke detectors as required. Provide all required power and control wiring including motor starters.
- D. Contractor shall submit control drawings for architect/engineer approval.

### 3.09 GUARANTEE

- A. The Contractor shall guarantee all wiring to be free from inherent mechanical and electrical defects for one (1) year. Manufacturer shall make available to the Owner a local service department, which shall stock standard parts on the premises. Maintenance is to be provided during normal working hours, at no cost to the owner, for a period of twelve (12) months from the date of acceptance of the installation, unless damage is caused by misuse, abuse or accident.

**END OF SECTION 283100**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Remove and dispose of surface debris as required.
- B. Remove and dispose of paving, sidewalk, curbs, etc.
- C. Clear site or designated areas of the site of plant life and grass as required, and dispose of as required.
- D. Remove and dispose of trees and shrubs as required.
- E. Remove and dispose of stumps and root system of trees and shrubs as required.
- F. Removal and storage of topsoil.

## 1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.

## 1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable local code(s) for disposal of debris.
- B. Burning of materials on site is prohibited.
- C. Coordinate clearing work with utility companies.

## PART 2 - PRODUCTS

## 2.01 NOT USED

## PART 3 - EXECUTION

## 3.01 PREPARATION

- A. Verify existing conditions.
- B. Identify existing plant life designated to be removed. Verify with Owner and Engineer prior to removal.
- C. Verify limits of clearing.

## 3.02 PROTECTION

- A. Locate, identify and protect utilities that are to remain from damage.
- B. Protect trees, plant growth and features designated to remain as final landscaping.
- C. Protect benchmarks and existing structures from damage or displacement. Any damage to existing structures is to be promptly repaired at no additional cost to the Owner.

## 3.03 APPLICATION

- A. Clear areas required for access to site and execution of work.

- B. Remove paving, curbs, debris and sidewalks as required.
- C. Remove trees and shrubs designated to be removed. Remove stumps, main root ball, surface rock and perishable debris.
- D. Clear undergrowth and dead wood without disturbing subsoil.
- E. Remove paving, debris, rock and extracted plant life from site and dispose of in accordance with State and local ordinances.
- F. Excavate topsoil from areas to be further excavated, re-landscaped or regraded. Do not excavate wet topsoil.
- G. Stockpile topsoil in area designated on site to a height not exceeding 8 feet. Protect from erosion. Remove excess topsoil not being reused from site. Do not remove any topsoil from the site prior to obtaining the approval of the Engineer.

**END OF SECTION 311110**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Removal of subsoil.
- B. Rough grading and cutting, filling and rough contouring the site for placement of topsoil or pavement base for final grading.
- C. Finish grading.

## 1.02 RELATED REQUIREMENTS

- A. Section 311000 - SITE CLEARING.
- B. Section 312316 - EXCAVATION
- C. Section 312323 - FILL: Filling and compaction.
- D. Section 329219 - SEEDING: Finished ground cover.

## PART 2 PRODUCTS

## 2.01 MATERIALS

- A. Topsoil: See Section 312323 - FILL.
- B. Seed: See Section 329219 - SEEDING.
- C. Other Fill Materials: See Section 312323 - FILL.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

## 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

## 3.03 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.



- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. See Section 312323 for filling procedures.
- G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

### 3.04 SOIL REMOVAL

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet (2.5 m); protect from erosion.

### 3.05 FINISH GRADING

- A. Before Finish Grading:
  - 1. Verify subgrade has been contoured and compacted.
  - 2. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.
- B. Where topsoil is to be placed, scarify surface to depth of 3 inches (75 mm).
- C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).
- D. Place topsoil in areas where seeding are indicated.
- E. Place topsoil where required to level finish grade.
- F. Place topsoil to thickness as scheduled.
- G. Place topsoil during dry weather.
- H. Remove roots, weeds, rocks, and foreign material while spreading.
- I. Near plants spread topsoil manually to prevent damage.
- J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- K. Lightly compact placed topsoil.

### 3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) (30 mm) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch) (13 mm).

**3.07 REPAIR AND RESTORATION**

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

**3.08 CLEANING**

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION 312200**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for slabs-on-grade, paving and landscaping.
- C. Excavation for site structures.
- D. Site excavation.

1.02 RELATED SECTIONS

- A. Section 312200 - Grading.
- B. Section 312323 - Fill: Backfilling excavated material.

1.03 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Provide safety barricades around open excavations.

1.04 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

1.05 COORDINATION

- A. Coordinate work under provisions of Section 013100.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, above ground and aerial utilities. Stake and flag locations.
- C. Notify utility company to remove or relocate utilities, if required.
- D. Protect above and below grade utilities which are to remain.
- E. Protect plant life, lawns and other features remaining as a portion of final landscaping.
- F. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- G. Notify the Engineer prior to commencement of excavation.

**3.02 EXCAVATION**

- A. Underpin adjacent structures that may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate landscaping and construction operations to the limits as indicated on the plans.
- C. Machine slope banks to angle of repose or less, until shored.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Hand trim excavation. Remove loose matter.
- F. Remove lumped subsoil, boulders, and rock.
- G. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- H. Correct unauthorized excavation at no extra cost to Owner in accordance with Section 312323.13.
- I. Stockpile excavated material in area designated on site and remove excess material not being reused from site.

**3.03 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Provide for visual inspection of bearing surfaces.

**3.04 PROTECTION**

- A. Protect work under provisions of Section 015000.
- B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

**END OF SECTION 312316**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Excavate trenches for piping and utilities outside building.
- B. Compacted bedding and backfill around and over piping and utilities to subgrade elevations.
- C. Backfilling and compaction.

## 1.02 REFERENCES

- A. ASTM C136/C136M - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D1557- Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 kg) Rammer and 18-inch (457 mm) Drop.

## 1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Test Reports: Submit a sieve analysis for bedding to be used.

## 1.04 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Architect/Engineer.
- B. Do not backfill over or with wet or frozen materials.
- C. Provide safety barricades around open excavations.

## 1.05 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as shown on plans.

## 1.06 COORDINATION

- A. Coordinate trenching with installation of pipe or conduit.
- B. Coordinate trenching with installation and removal of sheeting.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Bedding: Washed; free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C33-71a Size No. 67; within the following limits:

| Sieve Size | Percent Passing |
|------------|-----------------|
| 1"         | 100             |
| 3/4"       | 99              |
| 1/2"       | 63              |
| No. 4      | 6               |

- B. Subsoil: Reused, excavated material, free of lumps, rocks larger than 3 inches (75 mm) in size, debris and contaminants.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing site conditions and substrate.
- B. Verify fill materials to be reused are acceptable.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.

#### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Maintain and protect existing utilities remaining which pass through work area.
- C. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- D. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic. Any item damaged by the contractor shall be promptly repaired at the contractor's expense.
- E. Protect above and below-grade utilities which are to remain.
- F. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with subsoil fill and compact to density equal to or greater than requirements for subsequent backfill material.

#### 3.03 EXCAVATION

- A. Excavate subsoil required for piping.
- B. Cut trenches to the dimensions shown on the plans.
- C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock.
- F. For trenches made in solid rock, excavate to a depth of 1 foot (300 mm) below the proposed pipe invert.
- G. Correct unauthorized excavation at no cost to Owner in accordance with Section 312323 - FILL.
- H. Stockpile excavated material in area designated on site and remove excess material not being used from site. Remove excavated material from site.
- I. All trenches deeper than 5 ft (1.5 m) shall require sheeting.

#### 3.04 INSTALLATION - BEDDING

- A. Support pipe and conduit during placement and compaction of bedding fill.

- B. For trenches made in solid rock, place an additional 1 foot (300 mm) of bedding under pipe or conduit.
- C. Place bedding to the dimensions and limits as shown on the plans.
- D. Place bedding material against and to 1 foot (300 mm) over the top of the pipe or conduit in 6 inch (150 mm) compacted layers.
- E. All bedding material shall be compacted to 95 percent maximum dry density in accordance with ASTM D1557. Maintain optimum moisture content to attain required density.
- F. Place bedding simultaneously on both sides of the pipe or conduit.

### 3.05 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen materials.
- B. Backfill to the dimensions and limits shown on the plans with reused subsoil.
- C. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- D. Place and compact material in continuous layers not exceeding 6 inches (150 mm) compacted depth.
- E. Employ a placement method that does not disturb or damage conduit or pipe.
- F. All backfilled materials shall be compacted to 95 percent of maximum dry density in accordance with ASTM D1557. Maintain optimum moisture content to attain required density.
- G. Remove temporary sheeting as backfilling progresses.

### 3.06 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch (13 mm).
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch (25 mm).

### 3.07 FIELD QUALITY CONTROL

- A. Field testing is to be performed under provisions of Section 014500 - QUALITY CONTROL.
- B. Tests and analysis of fill material are to be performed in accordance with ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Unless additional testing is required by the Engineer, compaction tests shall be taken every 100 feet (30 m), at the springline of the pipe and every 2 vertical feet (610 mm) of backfill.

### 3.08 CLEANING

- A. Remove surplus backfill materials from site.
- B. Leave fill material stockpile areas completely free of excess fill materials.

3.09 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Recompect fills subjected to vehicular traffic.

**END OF SECTION 312318**



## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade, slabs-on-grade, paving, and site structures.
- B. Backfilling and compacting for utilities outside the building.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

## 1.02 RELATED REQUIREMENTS

- A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS: Slope protection and erosion control.
- B. Section 312316 - EXCAVATION: Removal and handling of soil to be re-used.

## 1.03 REFERENCE STANDARDS

- A. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.
- B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)).
- C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- E. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

## 1.04 SUBMITTALS

- A. See 013300 - SUBMITTALS for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Provide a letter certifying that each type of imported fill material has been provided by a NYSDEC certified clean fill source or has been tested in accordance with NYSDEC Unrestricted Soil Use Guidelines as defined in Subpart 375-6 Remedial Program Soil Cleanup Objectives.
- D. Test Reports: Submit sieve analysis and test results from NYSDEC Unrestrictive Soil Use Guidelines for each type of imported fill to be used.

## 1.05 QUALITY ASSURANCE

- A. Do not backfill wet or frozen materials.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

## PART 2 PRODUCTS

### 2.01 FILL MATERIALS

#### A. Imported Fill

1. All imported fill materials shall be provided by a NYSDEC certified clean fill source or meet the requirements of NYSDEC Unrestricted Soil Use Guidelines as defined in Subpart 375-6: Remedial Program Soil Cleanup Objectives.
2. Test samples of imported fill in accordance with the following table:

| Recommended Number of Soil Samples for Imported Soil |                                                                                                   |                                                |                                                                                             |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------|
| Contaminant                                          | VOC's                                                                                             | SVOC's, Inorganics, PBC's/Pesticides Composite | SVOC's, Inorganics, PBC's/Pesticides Discreet Samples/Composite                             |
| Soil Quantity (cy)                                   | Discreet Samples                                                                                  |                                                |                                                                                             |
| 0-50                                                 | 1                                                                                                 | 1                                              | 3-5 discrete samples from different locations will comprise a composite sample for analysis |
| 50-100                                               | 2                                                                                                 | 1                                              |                                                                                             |
| 100-200                                              | 3                                                                                                 | 1                                              |                                                                                             |
| 200-300                                              | 4                                                                                                 | 1                                              |                                                                                             |
| 300-400                                              | 4                                                                                                 | 2                                              |                                                                                             |
| 400-500                                              | 5                                                                                                 | 2                                              |                                                                                             |
| 500-800                                              | 6                                                                                                 | 2                                              |                                                                                             |
| 800-1,000                                            | 7                                                                                                 | 2                                              |                                                                                             |
| >1,000                                               | Add an additional 2 VOC and 1 composite for each additional 1,000 cubic yards or consult with DER |                                                |                                                                                             |

3. Provide materials from the same source throughout the work. Change of source requires approval from Engineer.

#### B. General Fill (Type D): Subsoil excavated on-site.

1. Graded.
2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris, no more than 15% passing No. 200 sieve; no more than 30% retained on 3/4" sieve.
3. Conforming to ASTM D2487 Group Symbol CL.

#### C. Topsoil: .

1. Graded.
2. Free of roots, rocks larger than 1/2 inch (12 mm), subsoil, debris, large weeds and foreign matter.
3. Acidity range (pH) of 5.5 to 7.5.
4. Containing a minimum of 5 percent and a maximum of 25 percent inorganic matter.
5. Conforming to ASTM D2487 Group Symbol OH.

- D. Type C - Sand: Natural river or bank sand; washed, free of silt, clay, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

| Screen Size | Percent Passing |
|-------------|-----------------|
|-------------|-----------------|

|                    |         |
|--------------------|---------|
| No. 4 (4.75 mm)    | 100%    |
| No. 14 (1.18 mm)   | 10-100% |
| No. 50 (0.30 mm)   | 5-90%   |
| No. 100 (0.15 mm)  | 4-30%   |
| No. 200 (0.075 mm) | 0-1%    |

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 312200 - Grading for additional requirements.

#### 3.02 PREPARATION

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to 95% maximum dry density in accordance with ANSI/ASTM D1557.
- C. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

#### 3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.
- G. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- H. Correct areas that are over-excavated.
  - 1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- I. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under paving, slabs-on-grade, and similar construction: 92 percent of maximum dry density.
- J. Reshape and re-compact fills subjected to vehicular traffic.

**3.04 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

**3.05 FIELD QUALITY CONTROL**

- A. See Section 014500 - QUALITY CONTROL, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.
- C. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

**3.06 CLEANING**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

**END OF SECTION 312323**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Wood Sheeting.
- B. Steel Sheeting
- C. Sheeting box.

## 1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.
- C. Section 312333 - Trenching.

## 1.03 REFERENCES

- A. Occupational Safety and Health Standards - Excavations; Final Rule (29 CFR Part 1926) - OSHA Standards.

## 1.04 QUALITY ASSURANCE

- A. Perform all work of this section in accordance with OSHA Standards and approved shop drawings.

## 1.05 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate work with all other sections requiring temporary sheeting and bracing.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Wood Sheeting: Hardwood species of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; free from wormholes, wind shakes, loose knots, decayed or unsound portions or defects which would impair its strength or tightness; 2 3 inches thick minimum.
- B. Steel Sheeting: ASTM A328, corrugated "Z" shape cross-section; of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; structurally sound; special shapes for corner construction and transition points.

| Property                           | Method     | Characteristic Value |
|------------------------------------|------------|----------------------|
| Compressive Strength (ksi)         | ASTM D695  | 66.54                |
| Compressive Strength via CLC (ksi) | ASTM D6641 | 73.07                |
| Compressive Modulus (Mpsi)         | ASTM D695  | 3.88                 |
| Tensile Strength (ksi)             | ASTM D638  | 64.77                |
| Tensile Modulus (Mpsi)             | ASTM D638  | 3.86                 |
| Flexural Strength (ksi)            | ASTM D790  | 88.19                |
| Flexural Modulus (Mpsi)            | ASTM D790  | 3.35                 |

|                     |            |       |
|---------------------|------------|-------|
| Izod (ft. lb. /in ) | ASTM d256  | 42.50 |
| SBS (psi)           | ASTM D2344 | 3727  |

| Property                           | Method     | Characteristic Value |
|------------------------------------|------------|----------------------|
| Compressive Strength (ksi)         | ASTM D695  | 21,44                |
| Compressive Strength via CLC (ksi) | ASTM D6641 | 21.09                |
| Compressive Modulus (Mpsi)         | ASTM D695  | 1.24                 |
| Tensile Strength (ksi)             | ASTM D638  | 7.78                 |
| Tensile Modulus (Mpsi)             | ASTM D638  | 1.02                 |
| Flexural Strength (ksi)            | ASTM D790  | 14.43                |
| Flexural Modulus (Mpsi)            | ASTM D790  | 1.11                 |
| Izod (ft. lb. /in )                | ASTM d256  | 4.33                 |
| SBS (psi)                          | ASTM D2344 | 1843                 |

- C. Sheeting Boxes: Steel, of size and dimensions capable of supporting excavation sides and soil pressures; structurally sound.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing soil substrate and site conditions and elevations are as indicated on the plans.
- B. Verify elevations and grades are as indicated on the plans.
- C. Verify proposed locations of excavations are as indicated on the plans.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage or other evidence of movement to ensure that systems are stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

#### 3.02 PREPARATION

- A. Excavate to a depth no greater than 4 feet from existing grade.
- B. Assemble and drive the sheeting in accordance with approved shop drawings.

#### 3.03 INSTALLATION - SHEETING

- A. Drive sheeting in place to thoroughly support both sides of the excavation using a sheeting hammer. Use a steam or pneumatic hammer for steel sheeting.
- B. Water jetting of sheeting will not be permitted. Do not loosen adjacent ground which might result in collapse.
- C. Install walls and braces or shores tight and in accordance with approved shop drawings prepared by the contractor's engineer.

**3.04 INSTALLATION - SHEETING BOX**

- A. Place box in trench utilizing a means which will not damage structural integrity of the box.
- B. Excavate ahead of the sheeting box only enough to advance the sheeting box and only immediately prior to moving the sheeting box.
- C. Backfill on both sides of the sheeting box as it is moved.

**3.05 REMOVAL OF SHEETING**

- A. Remove sheeting only as backfilling progresses.
- B. Carefully remove sheeting such that compacted backfill is not displaced. Add additional backfill to the areas vacated by the sheeting.
- C. All sheeting is to be removed from the site once its use is no longer required.
- D. Removing sheeting in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities and utilities.

**3.06 CLEANING**

- A. Clean work under provisions of Section 017423.
- B. Clean site of any debris and sheeting materials at completion of the work.

**END OF SECTION 314116**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Paving aggregates.

## 1.02 REFERENCE STANDARDS

- A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 2012, with Editorial Revision (2015).
- C. NYSDOT Standard Specifications Section 703-02.
- D. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

## 1.03 DELIVERY, STORAGE, AND HANDLING

- A. Aggregate Storage, General:
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

## PART 2 PRODUCTS

## 2.01 MATERIALS

- A. Aggregate Base Course: Angular, crushed, recycled concrete; free of shale, clay, friable materials and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

| # | Sieve Size | % Passing |
|---|------------|-----------|
| 1 | 2"         | 90-100    |
| 2 | 1/4"       | 30-65     |
| 3 | No. 40     | 5-40      |
| 4 | No. 200    | 0-10      |

- B. Material retained on the 1/2 inch (13 mm) sieve is coarse aggregate.
- C. Coarse aggregate shall not have more than 10 percent by weight of flat or elongated pieces. A flat or elongated piece is defined as being three times greater in the largest dimension as compared to its least dimension.
- D. The portion of the aggregate base course which passes the No. 40 (0.30 mm) screen shall have a plasticity index of one as tested in accordance with ASTM D4318.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.



- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

### 3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

### 3.03 INSTALLATION

- A. Place aggregate in maximum 3 inch (75 mm) layers and roller compact to 95% maximum dry density in accordance with ANSI/ASTM D1557.
- B. Level and contour surfaces to elevations and gradients indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. New pavement must be placed on properly compacted aggregate base course within 24 hours of final compaction. If aggregate base course is left open for more than 24 hours, re-compact and retest in accordance with ANSI/ASTM D1557.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

### 3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch (6.4 mm) measured with 10 foot (3 m) straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch (6.4 mm).
- C. Variation From Design Elevation: Within 1/2 inch (12.8 mm).

### 3.05 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

## END OF SECTION 321123

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Single course bituminous concrete paving.
- C. Surface sealer.

1.02 RELATED REQUIREMENTS

- A. Section 099113 - Exterior Painting: Pavement markings.
- B. Section 312200 - Grading: Preparation of site for paving and base.
- C. Section 312323 - Fill: Compacted subgrade for paving.

1.03 REFERENCE STANDARDS

- A. AI MS-2 - Asphalt Mix Design Methods; 2015.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of \_\_\_\_\_ Highways standard.
- B. Mixing Plant: Complying with State of \_\_\_\_\_ Highways standard.
- C. Obtain materials from same source throughout.

1.05 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aggregate for Base Course: In accordance with State of \_\_\_\_\_ Highways standards.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Asphalt Base Course: 3.0 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

**END OF SECTION 321216**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Painted pavement delineation.
- B. Painted pavement symbols.

## 1.02 RELATED SECTIONS

- A. Section 321216 - Asphaltic Concrete Paving.

## 1.03 REFERENCES

- A. New York State Department of Transportation Standard Specifications.

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on paint.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver all materials to the site in their original containers.
- C. Store all materials in a cool, dry place.
- D. Do not expose paint to open flames or temperatures which may ignite the paint.
- E. Store all materials such that the paint is not contaminated.

## 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply paint when the ambient temperature is below 40 degrees F.
- B. Do not apply paint to wet or frozen surfaces or when precipitation is occurring.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Paint: Flexible, non-skinning paint; homogeneous, conforming to the requirements of Section 640 of the New York State Department of Transportation Standard Specifications; color as indicated on the plans or directed by Engineer.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify that pavement is ready to receive work of this section.
- B. Beginning of application means applicator accepts existing conditions.

### 3.02 PREPARATION

- A. Remove all dirt, grease, oil or other foreign matter from pavement which might affect the bond between the pavement and the paint.
- B. Remove all temporary pavement markings without causing damage to the pavement.

### 3.03 APPLICATION

- A. Apply paint with spray type striping machines to achieve a dry film thickness of 14 mils to 16 mils at the locations and to the dimensions as indicated on the plans.
- B. Symbols may be rolled or brushed onto the pavement as long as a dry film thickness of 14 mils to 16 mils is achieved.
- C. All stripes and symbols shall have clean, sharp edges.

### 3.04 TOLERANCES

- A. Maximum offset from true position: 1 inch.

### 3.05 CLEANING

- A. Clean adjacent areas which received paint during work of this section.

### 3.06 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect painted markings from damage or discoloration until project is accepted by the Owner.

**END OF SECTION 321728**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Seeding.
- B. Mulch, fertilizer and other accessories.
- C. Maintenance.

## 1.02 REFERENCES

- A. Not Used

## 1.03 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

## 1.04 SUBMITTALS

- A. Product Data: Provide data on seed mixtures and lime.

## 1.05 QUALITY ASSURANCE

- A. Seed: Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

## 1.06 REGULATORY REQUIREMENTS

- A. Comply with applicable regulatory agencies.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016500.
- B. Deliver grass seed mixture in original sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver materials in waterproof bags showing weight, chemical analysis and name of manufacturer.

## 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not sow immediately following rain, during windy periods or if ground is frozen.
- B. Do not sow when the ambient temperature is expected to drop below 40 degrees F or rise above 90 degrees F during the time in which the seed will establish itself.
- C. Typical Planting Season: April 1st through May 15th or September 1st through October 15th.

## 1.09 COORDINATION

- A. Coordinate with grading and placement of topsoil.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Seed: Dry, fresh, re-cleaned seed of the latest crops and of the following proportions:

| <b>Seed Species (% by weight)</b> | <b>lbs/1,000 ft<sup>2</sup></b> | <b>lbs/acre</b> |
|-----------------------------------|---------------------------------|-----------------|
| 65% Creeping red fescue           | 2.0-2.6                         | 85-114          |
| 20% Perennial ryegrass            | 0.6-0.8                         | 26-35           |
| 15% Fine fescue                   | 0.4-0.6                         | 19-26           |

- B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; friable loam; free of subsoil, clay or impurities, plants, weeds, roots, grass, stone and foreign matter; acidity range (pH) of 5.8 to 6.5; containing a minimum of 2.75 percent and a maximum of 25 percent organic matter. Topsoil may be reused from on-site if it meets these requirements

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify existing substrate and site conditions under provisions of 013100 - PROJECT MANAGEMENT AND COORDINATION.
- B. Verify that prepared soil base is ready to receive the work of this section.
- C. Beginning of installation means installer accepts existing conditions.

## 3.02 PREPARATION

- A. Seed Bed: Scarify soil to a depth of 6 inches in compacted areas. Smooth out unsightly variations, bumps, ridges, and depressions which will hold water. Remove stones, litter, or other objectionable material.
- B. Eliminate uneven areas and low spots. Remove and dispose of debris, roots, branches and stones in excess of 1/2 inch in size. Remove and dispose of subsoil contaminated with petroleum products.
- C. Scarify subsoil to depth of 6 inches where topsoil is scheduled to be placed. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

## 3.03 APPLICATION

- A. Do not seed areas in excess of that which can be mulched on same day.
- B. Roll seeded area with roller not exceeding 100 lbs per foot of width.
- C. Immediately following seeding and compacting, apply mulch at a rate of 92 lbs per 1,000 square feet. Maintain clear of shrubs and trees.
- D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil. Discontinue watering if washing begins to occur.

- E. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 8 feet on center.
- F. Cover seeded slopes where grade is 30 percent or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- G. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- H. Secure outside edges and overlaps at 36 inch intervals with stakes.
- I. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- J. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 12 inches.

#### 3.04 MAINTENANCE

- A. Maintain grass until job is accepted by the Owner or until the grass exhibits a vigorous growing condition, as determined by at least 2 cuttings, whichever occurs last.
- B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- C. Neatly trim edges and hand clip where necessary.
- D. Immediately remove clippings after mowing and trimming.
- E. Water to prevent grass and soil from drying out.
- F. Immediately reseed areas which show bare spots.

#### 3.05 PROTECTION

- A. Protect seeded areas with warning signs and temporary fencing during maintenance period.

**END OF SECTION 329219**

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A. New trees, plants, and ground cover.
- B. Mulch and Fertilizer.
- C. Maintenance.

## 1.02 PRICE AND PAYMENT PROCEDURES

- A. Allowances:
  - 1. See Section 012100 - Allowances, for cash allowances affecting this section.
  - 2. Include the cash allowance listed in the proposal for the purchase of trees, plants, and groundcover.

## 1.03 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.
- B. Plants: Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

## 1.04 REFERENCE STANDARDS

- A. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock; 2014.
- B. ANSI A300 Part 1 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices; 2017.

## 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Submit list of plant life sources.

## 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing and planting the plants with two years experience.
- B. Non-native, Invasive Plant Species: Do not introduce, grow, or cultivate plant species that are non-native to the ecosystem of the project site, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
  - 1. Comply with laws regulating non-native and invasive plant species in the State in which the Project is located.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.



- B. Protect and maintain plant life until planted.
- C. Deliver plant life materials immediately prior to placement. Keep plants moist.

#### 1.08 FIELD CONDITIONS

- A. Do not install plant life when ambient temperatures may drop below 35 degrees F (2 degrees C) or rise above 90 degrees F (32 degrees C).
- B. Do not install plant life when wind velocity exceeds 30 mph (48 k/hr).

#### 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide one year warranty.
- C. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.
- D. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

### PART 2 PRODUCTS

#### 2.01 PLANTS

- A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

#### 2.02 SOIL MATERIALS

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.

#### 2.03 SOIL AMENDMENT MATERIALS

- A. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.
  - 1. Nitrogen: 10 percent.
  - 2. Phosphoric Acid: 6 percent.
  - 3. Soluble Potash: 4 percent.
- B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.
- C. Bone Meal: Commercial, steamed finely ground material containing not less than 1.0 percent nitrogen and 11 percent phosphoric acid.

#### 2.04 MULCH MATERIALS

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

## 2.05 ACCESSORIES

- A. Wrapping Materials: Burlap.
- B. Stakes: Softwood lumber, pointed end.
- C. Cable, Wire, Eye Bolts : Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that prepared subsoil and planters are ready to receive work.
- B. Saturate soil with water to test drainage.
- C. Verify that required underground utilities are available, in proper location, and ready for use.

### 3.02 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- C. Scarify subsoil to a depth of 3 inches (75 mm) where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
- D. Dig pits and beds 6 inches (150 mm) larger than plant root system.

### 3.03 PLACING TOPSOIL

- A. Spread topsoil to a minimum depth of 4 inches (100 mm) over area to be planted. Rake smooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches (150 mm).

### 3.04 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after initial raking of topsoil.
- C. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- D. Lightly water to aid the dissipation of fertilizer.

### 3.05 PLANTING

- A. Place plants for best appearance.
- B. Provide planting plan for review and approval by Owner and Engineer prior to placement.
- C. Set plants vertical.
- D. Remove non-biodegradable root containers.
- E. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches (150 mm) under each plant. Remove burlap, ropes, and wires, from the root ball.
- F. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch (150 mm) layers. Maintain plant life in vertical position.
- G. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

### 3.06 INSTALLATION OF ACCESSORIES

- A. Wrap deciduous shade and flowering tree trunks and place tree protectors.

### 3.07 PLANT SUPPORT

- A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
  - 1. Tree Caliper: 1 inch (25 mm); Tree Support Method: 1 stake with one tie
  - 2. Tree Caliper: 1 to 2 inches (25 to 50 mm); Tree Support Method: 2 stakes with two ties
  - 3. Tree Caliper: 2 to 4 inches (50 to 100 mm); Tree Support Method: 3 guy wires with eye bolts and turn buckles
  - 4. Tree Caliper: Over 4 inches (100 mm); Tree Support Method: 4 guy wires with eye bolts and turn buckles

### 3.08 FIELD QUALITY CONTROL

- A. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

### 3.09 MAINTENANCE

- A. Irrigate sufficiently to saturate root system and prevent soil from drying out.
- B. Neatly trim plants where necessary.
- C. Immediately remove clippings after trimming.
- D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.
- E. Remedy damage from use of herbicides and pesticides.

### END OF SECTION 329300

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Corrugated polyethylene pipe.
- B. Fittings and accessories.

## 1.02 RELATED SECTIONS

- A. Section 312333 - Trenching.

## 1.03 REFERENCES

- A. ASTM D2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- B. ASTM F405 - Corrugated Polyethylene (PE) Tubing and Fittings.
- C. ASTM F667 - Large Diameter Corrugated Polyethylene Tubing and Fittings.

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on pipe, fittings and accessories.
- C. Manufacturer's Instructions: Indicate special procedures and conditions required to install products specified.

## 1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of pipe runs, connections and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## 1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for materials and installation of the work of this section.
- B. Install pipe in accordance with ASTM D2321.

## 1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the plans and as required by the manufacturer.

## 1.08 COORDINATION

- A. Coordinate pipe installation with the trenching.

## PART 2 - PRODUCTS

## 2.01 COMPONENTS

- A. Corrugated Polyethylene Pipe: ASTM F405 or ASTM F667 corrugated polyethylene; N-12 manufactured by ADVANCED DRAINAGE SYSTEMS, INC. or specifically approved equal.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that trench cut is ready to receive work and excavations, dimensions and elevations are as indicated on the plans.

## 3.02 PREPARATION

- A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.
- B. Excavate under provisions of Section 312316.

## 3.03 INSTALLATION

- A. Install pipe and accessories in accordance with manufacturer's instructions and approved shop drawings.
- B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
- C. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.
- D. Lay pipe to slope gradients noted on the plans, with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Backfill under provisions of Section 312323.13.

## 3.04 TOLERANCES

- A. Maximum Variation from Intended Invert Elevation: 1/2 inch.
- B. Maximum Offset of Pipe from True Alignment: 1 inch.

## 3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

## 3.06 PROTECTION

- A. Protect pipe from damage or displacement until backfilling operation is in progress.

**END OF SECTION 334116**

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. PVC pipe for drainage.
- B. Fittings and accessories.

## 1.02 RELATED SECTIONS

- A. Section 312333 - Trenching
- B. Section 312323.13 - Backfilling

## 1.03 REFERENCES

- A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity Flow Applications.
- B. ASTM D2729 - Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- C. ASTM D2855 - Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.
- D. ASTM D3034 - Standard Specification for Type PDM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- E. ASTM D3212 - Standard Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on pipe, fittings, accessories and marking tape.

## 1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record actual locations of pipe runs, connections and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## 1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for materials and installation of the work of this section.

## 1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the plans and as required by the manufacturer.

## 1.08 COORDINATION

- A. Coordinate pipe installation with trenching and installation of drainage structures.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. PVC Pipe: CERTAINTEED, JM, CARLON.
- B. Joint Lubricant: Manufacturer's standard.

## 2.02 MATERIALS

- A. PVC - ANSI/ASTM D3034, Type PSM, Polyvinyl Chloride (PVC) material; inside nominal diameter as indicated, integral bell and spigot end joints, class DR 18 or SDR 35 as indicated on plans. Joints meet or exceed ASTM D3212.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that trench cut is ready to receive work and excavations, dimensions and elevations are as indicated on the plans.
- C. Inspect all pipe and fittings before installation. Remove defective pipe from site.

## 3.02 PREPARATION

- A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.
- B. Excavate under provisions of Section 312316. Excavate sufficient clearance at each bell or coupling to allow uniform bearing along the pipe barrel.

## 3.03 INSTALLATION

- A. Install pipe and accessories in accordance with ASTM D2321.
- B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
- C. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.
- D. Lay pipe to slope gradients noted on the plans, with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Repair surface damage to any pipe protective coating in accordance with manufacturer's recommendations.
- F. Backfill under provisions of Section 312323.13.
- G. After partially backfilling, install marking tape 18 to 24 inches above crown of pipe.
- H. Construct cleanouts at locations shown and as detailed on the drawings. Use PVC wyes, bends and pipe as appropriate. Extend cleanout pipe to grade and terminate with plug.

3.04 TOLERANCES

- A. Maximum Variation from Intended Invert Elevation: 1/2 inch.
- B. Maximum Offset of Pipe from True Alignment: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection under provisions of Section 014500.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.06 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect pipe from damage or displacement until backfilling operation is in progress.

**END OF SECTION 334123**



## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Precast concrete catch basins and field inlets.
- B. Castings.

## 1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.
- C. Section 334116 -Corrugated Polyethylene Pipe.

## 1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- C. ASTM C55 - Concrete Building Brick.
- D. ASTM C150 - Portland Cement.

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and details of catch basins and castings.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Store products on firm and level ground.
- C. Handle products in such a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.
- D. Any cracked or otherwise defective materials will be rejected.

## 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

## 1.07 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate with excavation, backfilling, installation of piping and all other work.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. OLD CASTLE PRECAST, INC.
- B. PRECAST CONCRETE SALES, CO.
- C. MID HUDSON CONCRETE PRODUCTS.
- D. WOODARD'S CONCRETE PRODUCTS.
- E. Substitutions shall be permitted only after receiving written approval from the Engineer.

## 2.02 MATERIALS

- A. Catch Basin and Field Inlet Sections: Reinforced precast concrete, lipped male/female joint, of the following materials:
  - 1. Concrete: ASTM C150 normal Portland cement, Type 1; minimum 4,000 psi strength at 28 days.
  - 2. Reinforcement: ASTM A615 reinforcing bars.
  - 3. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface, non-rocking; removable grate, capable of supporting the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and pattern as indicated on the plans, manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

## 2.03 ACCESSORIES

- A. Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.
- B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.
- C. Catch Basin Steps: Cast iron rungs; pattern number 2589 as manufactured by CAMPBELL FOUNDRY COMPANY; pattern number R-1980-C as manufactured by NEENAH FOUNDRY COMPANY, or specifically approved equal.
- D. Concrete for Formed Invert: ASTM C150 Portland cement type I, cast in place; 3,000 psi minimum strength at 28 days; dimensions as indicated on the plans.

## 2.04 FABRICATION

- A. Fabricate and reinforce catch basin to the dimensions as indicated on the plans.
- B. Pipe Entry: Provide openings as required.
- C. Steps: Set or drilled and grouted in the catch basin wall at 18 inches on center vertically.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify existing grades are as indicated on the plans.

- B. Verify items provided by other sections of work are properly sized and located.
- C. Verify that rough openings for piping are as required.

### 3.02 INSTALLATION

- A. Form bottom of excavation clean and smooth to correct elevation. Compact bottom of the excavation to a minimum of 95 percent of maximum dry density.
- B. Place catch basin, secure and level, to the proper elevation. Utilize a placement method which will not damage or crack the catch basin.
- C. Place catch basin sections plumb and level, trim to correct elevations.
- D. Cut and fit for pipe. Seal openings in wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.
- E. When indicated on the plans, place concrete in base of catch basin as required to form invert to the dimensions indicated on the plans. Trowel smooth.
- F. Set slab top on catch basin in a 1 inch mortar bed.
- G. Mount casting in a 1 inch mortar bed over access opening. Install firm, level and to the required elevation.
- H. If required to achieve proper elevation of casting, adjust with brick and mortar. A maximum height of 5 inches is permitted between the catch basin and the base of the casting. Maintain a maximum of 1 inch thickness of mortar between all bricks.

### 3.03 TOLERANCES

- A. Maximum Variation from Proposed Rim Elevation: 1/4 inch.
- B. Maximum Variation from Proposed Location: 1/2 inch.

### 3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.
- B. Request inspection prior to backfilling around structure and prior to surface restoration.

### 3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect catch basin from damage or displacement until project is accepted by the Owner.

### END OF SECTION 334413.13

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Precast concrete manhole sections with tongue-and-groove joints, covers, anchorage and accessories.

## 1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfill.

## 1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- C. ASTM C55 - Concrete Building Brick.
- D. ASTM C150 - Portland Cement.
- E. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
- F. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and details of manhole sections and castings.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Store products on firm, level ground.
- C. Handle products in a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.
- D. Any cracked or otherwise defective materials will be rejected.

## 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

## 1.07 COORDINATION

- A. Coordinate the work under provisions of Section 013100.
- B. Coordinate with installation of piping and all other work.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. OLDCASTLE PRECAST, INC.
- B. COASTAL PIPELINE PRODUCTS, INC.
- C. Substitutions shall be permitted only after receiving written approval from the Engineer.

## 2.02 MATERIALS

- A. Manhole Sections: ASTM C478 reinforced precast concrete lipped male/female joint, ASTM C443 gaskets; of the following materials:
  - 1. Concrete: ASTM C150, normal Portland cement Type I, minimum 4,000 psi strength at 28 days.
  - 2. Reinforcement: ASTM A615 reinforcing bars.
- B. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface, non-rocking, removable lid, open checkerboard grille lid design; able to support the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and dimensions as indicated on the plans; manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

## 2.03 ACCESSORIES

- A. Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.
- B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.
- C. Manhole Steps: Cast iron rungs; pattern number 2589-2252 as manufactured by CAMPBELL FOUNDRY COMPANY, or specifically approved equal.
- D. Concrete for Formed Invert: ASTM C150 Portland cement Type I, cast in place; 3,000 psi minimum strength at 28 days; wood float finish; dimensions as indicated on the plans.

## 2.04 FABRICATION

- A. Shaft Construction: Concentric with cone top section; lipped male/female joints with rubber gasket; dimensions and reinforcement as indicated on the plans.
- B. Pipe Entry: Provide openings as required.
- C. Steps: Set or drilled and grouted into manhole wall at 18 inches on center vertically.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Verify existing site conditions.
- B. Verify existing grades are as indicated on the plans.

- C. Verify items provided by other sections of Work are properly sized and located.
- D. Verify that rough openings for piping are as required.

### 3.02 INSTALLATION

- A. Form bottom of excavation clean and smooth to the correct elevation.
- B. Place base pad, secure and level, to the proper elevation. Utilize a placement method which will not damage or crack the manhole.
- C. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- D. Cut and fit for pipe. Seal openings in shaft wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.
- E. Place concrete in base of manhole as required to form invert to the dimensions indicated on the plans. Trowel smooth.
- F. Mount castings in a 1 inch mortar bed over access opening. Install firm, level and to the required elevation.
- G. If required to achieve proper elevation of casting, adjust with brick and mortar.

### 3.03 TOLERANCES

- A. Maximum Variation from Proposed Rim Elevation: 1/4 inch.
- B. Maximum Variation from Proposed Location: 1/2 inch.

### 3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Request inspection prior to backfilling around structure and prior to surface restoration.

### 3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect manhole from damage or displacement until project is accepted by the Owner.

### END OF SECTION 334913.13

## **APPENDIX A**

### **VAILS GATE FIRE DISTRICT**

**NEW STORAGE BUILDING (Phase 1)  
And  
NEW FIREHOUSE (Phase 2)  
872 BLOOMING GROVE TURNPIKE, NEW YORK 12553**

**2021 REPORT BY CARLIN SIMPSON & ASSOCIATES**



**CARLIN • SIMPSON & ASSOCIATES**  
Consulting Geotechnical and Environmental Engineers

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12 March 2021

H2M Architects + Engineers  
538 Broad Hollow Rd, 4th Floor East  
Melville, NY 11747

Attn: Ms. Katie Cerniglia, RA  
Project Architect

Re: Report on Subsurface Soil and Foundation Investigation  
Proposed Building-New Firehouse  
872 Blooming Grove Turnpike  
New Windsor, NY (CSA Job #20-226)

Dear Ms. Cerniglia:

In accordance with our proposal dated 24 November 2020 and your subsequent authorization, we have completed a Subsurface Soil and Foundation Investigation for the referenced site. The purpose of this study was to determine the nature and engineering properties of the subsurface soil and groundwater conditions for the new construction, to recommend a practical foundation scheme, and to determine the allowable bearing capacity of the site soils.

We understand that the planned construction will consist of a new 2-story firehouse. The proposed construction will also include a new storage building, new underground utilities, and new paved parking areas and driveways. To guide us in our study, you have provided us with a site plan that indicates the location of the proposed construction.

Our scope of work for this project included the following:

1. Reviewed the proposed layout, the existing site conditions, the expected soil conditions, and planned this study.
2. Retained General Borings Inc. to advance six (6) test borings at the subject site.
3. Laid out the boring locations in the field, provided full time inspection of the explorations, obtained soil samples, and prepared detailed logs and a Boring Location Plan.
4. Performed laboratory soil identification tests on selected soil samples.



5. Analyzed the field and laboratory test data and prepared this report containing the results of this study.

## **1.0 SITE DESCRIPTION**

The project site is located at 872 Blooming Grove Turnpike in New Windsor, New York. The site is currently occupied by an active fire station (Vails Gate Fire Co.) with a 2-story masonry building. There are also a few small structures in the rear of the property. The remainder of the site consists of an asphalt paved parking lot. The site grades are generally flat.

## **2.0 PROPOSED CONSTRUCTION**

We understand that the planned construction will consist of replacing the existing firehouse with a new 2-story firehouse. The new firehouse has a larger footprint than the existing building and will be located in the same general area. In addition, a new storage building is proposed in the eastern portion of the site. The storage building will be about 61 feet by 20.5 feet and located to the south of the existing training building. The finished floor elevations of the proposed buildings were unknown at the time of this report, but we understand that they will both be slab-on-grade structures.

The following evaluation is based on the limited information that has been provided to our office as of the date of this report. Once the project plans have been further developed, a copy of the plans should be forwarded to our office so that we can review them along with the recommendations in this report. At that time, any changes or additional recommendations can be provided, if required.

## **3.0 SUBSURFACE CONDITIONS**

To determine the subsurface soil and groundwater conditions at the site, six (6) test borings were advanced by General Borings Inc. at the locations shown on the enclosed Boring Location Plan. The borings were performed using hollow stem augers and split spoon sampling. The borings were completed in January 2021 under the full-time inspection of Carlin-Simpson & Associates. Detailed boring logs have been prepared and are included in this report. Our field engineer visually identified all of the soil samples obtained during the boring operations and select samples were tested in our laboratory. The results of these tests are also included in this report.

### **3.1 Soil and Rock**

The soil descriptions shown on the boring logs are based on the Burmister Classification System. In this system, the soil is divided into three components: Sand (S), Silt (\$) and Gravel (G). The major component is indicated in all capital letters, the lesser in lower case letters. The following modifiers indicate the quantity of each lesser component:

| <b><u>Modifier</u></b> | <b><u>Quantity</u></b> |
|------------------------|------------------------|
| trace (t)              | 0 -10%                 |
| little (l)             | 10% - 20%              |
| some (s)               | 20% - 35%              |
| and (a)                | 35% - 50%              |

The subsurface soil and rock conditions encountered in the borings can be summarized as follows:

|                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><u>Stratum 1A</u></b><br>Asphalt                    | The surface layer borings B-1 through B-3 consists of asphalt pavement that ranges from approximately 3 to 7 inches in thickness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b><u>Stratum 1B</u></b><br>Topsoil                    | The surface layer in borings B-4 through B-6 consists of topsoil that ranges from approximately 2 to 8 inches in thickness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b><u>Stratum 2</u></b><br>Existing Fill               | Beneath the surface layers in each of the borings is existing fill that generally consists of loose to medium dense brown, gray, black coarse to fine SAND, little (to and) Silt, little (to and) coarse to fine Gravel. Debris (i.e. ash, bricks, glass, and asphalt) was noted within this stratum. Cobbles and boulders were also encountered within this stratum at select locations. In boring B-1, a layer within the fill stratum consists of black SILT some, coarse to fine Sand, little coarse to fine Gravel. The existing fill in the borings extends to depths ranging from 5'0" to 8'6" below existing ground surface.                                      |
| <b><u>Stratum 3</u></b><br>Silty Sand with Gravel      | Beneath the existing fill in borings B-1, B-2, and B-5 is medium dense to dense brown coarse to fine SAND, little (to some) Silt, little (to some) coarse to fine Gravel. In the borings the Silty Sand with Gravel extends to depths ranging from 6'0" to 14'0" below the existing ground surface.                                                                                                                                                                                                                                                                                                                                                                       |
| <b><u>Stratum 4</u></b><br>Completely Weathered Gneiss | Underlying the existing fill in borings B-3, B-4, and B-6 and below the silty sand with gravel in boring B-5 is completely weathered shale. This layer is soil like in state, however, there could be denser pockets that cannot be conventionally excavated. The completely weathered Shale was encountered at depths ranging from about 5'11" to 8'0" below the existing ground surface at the referenced boring and transitions to harder Shale bedrock with depth.                                                                                                                                                                                                    |
| <b><u>Stratum 5</u></b><br>Shale Bedrock               | Auger refusal on probable Shale bedrock was encountered in borings B-1 and B-4 through B-6 at depths ranging from 10'0" to 14'6" below the existing ground surface. The upper portion of the Shale bedrock was cored at borings B-2 and B-3 starting at depths of 14'0" and 13'0" below the existing ground surface, respectively. The rock core recoveries were 100% and 94% and the rock quality designation (RQD) of the recovered cores were 45% and 8%, respectively. Based on the RQD and visual inspection, the upper portion of the bedrock ranges from very poor quality in a crushed condition to poor quality in a shattered, very blocky and seamy condition. |

### **3.2 Bedrock**

Based on our experience and the boring observations, the upper portion of the in-situ bedrock at the site will range from completely weathered rock in a soil-like state, to shattered, very block and seamy in a poor condition. The rock quality generally transitions to harder bedrock with increasing depth. The completely weathered rock was encountered at depths ranging from 5'11" to 8'0" below the ground surface. Auger refusal on harder bedrock was encountered at depths ranging from 10'0" to 14'6" below the existing ground surface. The bedrock observations are summarized in Table 1.

Based on the boring observations and the anticipated construction, completely weathered rock and harder bedrock are not expected to be encountered in the foundation excavations for either of the buildings.

### **3.3 Groundwater**

During this investigation, groundwater was encountered in 4 of the 6 borings at depths ranging from 5'6" to 6'0" below the existing ground surface. The groundwater observations are summarized in Table 1. Based on the boring observations and the planned construction, the building excavation will extend 1 to 2 feet below the groundwater table to remove the existing fill. Where groundwater is encountered during the construction, proper groundwater control measures (i.e. dewatering with sumps and pumps) will be required.

Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration.

### **3.4 Summary of Site Boring Observations**

A summary of the boring observations is provided in Table 1 below.

**Table 1 – Summary of Boring Observations**

| <b>Boring No.</b> | <b>Depth to Groundwater</b> | <b>Depth to Bottom of Existing Fill</b> | <b>Depth to Bedrock</b>   |
|-------------------|-----------------------------|-----------------------------------------|---------------------------|
| B-1               | 6'0"                        | 8'6"                                    | AR @ 12'0"                |
| B-2               | 5'6"                        | 5'0"                                    | C @ 14'0"                 |
| B-3               | No Reading                  | 8'0"                                    | CWR @ 8'0"<br>C @ 13'0"   |
| B-4               | NE to 10'0"                 | 6'11"                                   | CWR @ 6'11"<br>AR @ 10'0" |
| B-5               | 6'6"                        | 5'0"                                    | CWR @ 6'0"<br>AR @ 14'6"  |
| B-6               | 6'0"                        | 5'11"                                   | CWR @ 5'11"<br>AR @ 13'0" |

NE – Not Encountered

CWR – Completely Weathered Rock

AR – Auger or Bucket Refusal

C – Cored Bedrock

## **4.0 SUMMARY OF DESIGN RECOMMENDATIONS**

Below is a summary of the major design and construction considerations for this project. Additional recommendations are provided in the following sections of this report.

- *Subsurface Conditions (Section 3.0)*
  - Existing fill was encountered at each boring location to depths ranging from 5'0" to 8'5" below the existing ground surface.
  - Groundwater was encountered in 4 of the 6 borings at depths ranging from 5'6" to 6'0" below the existing ground surface.
  - Completely weathered rock and/or harder bedrock was encountered in each of the borings at depth ranging from 5'11" to 14'6" below the existing ground surface.
  - A summary of the subsurface observations is provided in Table 1.
- *Building Area Preparation (Section 5.1)*
  - Existing structures must be demolished and existing surface materials must be stripped from proposed building areas.
  - New backfill shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557).
  - Existing fill is not suitable for support of the proposed building foundations or floor slabs in its current state.
- *Building Foundation Recommendations (Section 5.2)*
  - *Shallow Spread Foundation – Completely Remove and Replace Existing Fill*
    - Existing fill shall be completely removed from the proposed building areas and replaced with new structural fill.
    - Sumps and pumps will be needed during construction where the excavations extend below the water table.
    - The preparation of wet and sensitive subgrades with geotextile fabric and clean stone may also be necessary.
    - The new foundations may be designed as spread footing type foundations bearing on virgin soil, engineer-approved compacted fill, crushed stone, or weathered rock.
    - Net design bearing pressure is 4,000 psf.
    - Minimum depth for frost protection is 42 inches.
    - The virgin soil, new compacted fill, and weathered bedrock can be used for support of the proposed floor slabs.
    - The floor slabs may be designed as slab on grade.
    - Modulus of subgrade reaction is 200 pci.
    - Seismic Site Class is C or Very Stiff Soil or Soft Rock Profile.
  - *Ground Improvement Alternatives*
    - Rammed Aggregate Piers (RAP)
    - Rapid Impact Compaction (RIC)
- *Additional Site Recommendations (Section 6.0)*
  - Pavement: Densified existing fill, virgin soil, and new compacted fill may be used to support the new pavement.
  - Utilities: New utilities may bear in the densified existing fill, virgin soil, new compacted fill, or weathered rock.

## **5.0 BUILDING EVALUATION**

We understand that the planned construction will consist of replacing the existing firehouse with a new 2-story firehouse. The new firehouse has a larger footprint than the existing

building and will be located in the same general area. In addition, a new storage building is proposed in the eastern portion of the site. The storage building will be about 61 feet by 20.5 feet and located to the south of the existing training building. The finished floor elevations of the proposed buildings were unknown at the time of this report, but we understand that they will both be slab-on-grade structures.

Existing fill was encountered in each of the borings throughout the site to depths ranging from 5'0" to 8'5" below the existing ground surface. The depth of the existing fill is expected to be variable and may be deeper in unexplored areas of the site. The existing fill is not an acceptable bearing material for the new building foundations or floor slabs. The consistency and density of the soil fill are not predictable. Certain areas may contain clean dense soils while other areas may contain loose material, void spaces, and/or debris. The existing soil fill creates the possibility of intolerable differential settlements under loading.

To eliminate damaging differential settlement, the existing fill must be either completely removed from the building footprint and replaced with new compacted fill or the existing fill material must be improved. Ground improvement methods suitable for this project include rammed aggregate piers (RAP) system or rapid impact compaction (RIC). The ground improvement methods are further discussed in Section 5.3 of this report.

Provided that the proposed building areas are prepared as outlined in this report, it is our opinion that the virgin soil, new engineer-approved compacted fill, improved subgrade soils, and completely weathered rock can adequately support the new building foundations and floor slabs. Recommendations for preparation of the building areas are provided in Section 5.1. Foundation recommendations for the new buildings are provided in Section 5.2 and 5.3 below.

### **5.1 Building Area Preparation**

In order to prepare the site for construction, all surface materials such as asphalt, vegetation and topsoil shall be removed from the planned building areas, extending at least ten (10) feet beyond the new construction limits, where practical.

As part of the site development, the existing 2-story firehouse will be demolished. All debris resulting from the demolition of this structure must be completely removed from the new building footprint, extending at least ten (10) feet beyond the new building limit, where practical. This shall include the complete removal of all foundations, floor slabs, utilities, pavement, and miscellaneous debris. Where the removal of existing structures or associated materials extends below the planned building, the resulting excavations shall be backfilled with new compacted fill as described below.

Existing utilities, where they are encountered within the planned building areas, should be either abandoned or rerouted around the new structures. Once the utility has been rerouted or abandoned, the section of pipe and any associated structure within the building areas should be completely removed. The removal of the pipe and structure must also include any loose fill around the pipe or structure. After the pipe, associated structure, and associated loose backfill have been removed, the resulting excavation shall be backfilled with new controlled fill as described below.

### Installation of New Structural Fill

Where new fill is required to achieve final grades shall consist of either engineer-approved on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% by weight passing a No. 200 sieve. The new fill shall be placed in layers not exceeding one (1) foot in thickness and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557). Each layer must be compacted, tested, and approved by Carlin-Simpson & Associates or a qualified geotechnical engineer prior to placing subsequent layers. The suitability of the on-site soil and rock for reuse as compacted fill is discussed in Section 6.7 below.

If imported structural fill will be required during construction, the imported structural fill shall meet the following specified gradation:

| <u>US Standard Sieve Size</u> | <u>Percent Finer By Weight</u> |
|-------------------------------|--------------------------------|
| 3-inch                        | 100                            |
| No. 4                         | 30-80                          |
| No. 40                        | 10-50                          |
| No. 200                       | 0-20                           |

## **5.2 Foundation Alternative #1 – Completely Remove and Replace Existing Fill**

Existing fill is present throughout the site to depths ranging from 5'0" to 8'5" below the existing ground surface. As discussed above, the existing fill is not a suitable bearing material for the new building foundations and floor slabs. For this alternative, where existing fill is encountered in the building areas, it shall be completely removed and replaced as described below.

The excavation of the existing fill will likely extend 1 to 2 feet below the groundwater table. Therefore, dewatering with sumps and pumps will be necessary. In addition, handling wet subgrade procedures may be necessary in the event that the subgrade becomes destabilized. Our recommendations for these situations are described below.

### **5.2.1 Removal of Existing Fill & Building Subgrade Preparation**

Where existing fill is present below the planned building subgrade elevation, the excavation shall extend through the existing fill down to the virgin soil or completely weathered rock. At the bottom of the excavation, the removal of the unsuitable material shall extend horizontally beyond the building limits a minimum distance of 1'0" plus a distance equal to the depth of the excavation below the planned foundation bearing elevation. For example, if the removal of the existing fill extends vertically 4'0" below the planned foundation bearing elevation, the excavation must extend horizontally a minimum of 5'0" (1'0" plus 4'0") beyond the new building limits at that location.

The removal of the existing fill from the proposed building areas shall be performed under the full time inspection of Carlin-Simpson & Associates or a qualified geotechnical engineer. The on-site representative shall direct the contractor during this operation to ensure that all of the unsuitable material has been removed from the proposed building areas.

During the removal of the unsuitable material, the contractor should segregate the potentially re-usable existing soil/fill material from the non-reusable fill (i.e. debris and topsoil). The on-site representative from Carlin-Simpson & Associates or the qualified geotechnical engineer shall evaluate the suitability of the excavated materials for use as compacted fill during the excavation and prior to its re-use. Potentially usable fill should be stockpiled and covered with tarps or plastic sheeting for protection from excess moisture. Any fill material that is or becomes wet must be dried prior to its re-use.

#### Densification of Subgrade Soils (Proofrolling)

After the surface materials, demolition debris and existing fill are removed as outlined above and prior to the placement of new structural fill, the exposed subgrade soil must be graded level shall be proofrolled with at least five (5) passes of a large vibratory drum roller (i.e. Dynapac CA 250 or equivalent). The proofrolling is necessary to densify the underlying soils. Proofrolling must be performed prior to the excavation for new foundations and/or the installation of new compacted fill in the building area.

A representative from Carlin-Simpson & Associates or a qualified geotechnical engineer shall observe the proofrolling operation. If any excessive movement is noted during the proofrolling, the soft soil shall be removed and replaced with new compacted fill. The on-site representative shall be responsible for determining what material, if any, is to be removed and will direct the contractor during this operation. The subgrade proofrolling may be eliminated, if in the opinion of the geotechnical engineer, the proofrolling will cause pumping or otherwise disturb the stability of the subgrade.

#### Handling Groundwater During Construction

Groundwater was encountered in 4 of the 6 borings at depths ranging from 5'6" to 6'0" below the existing ground surface. Based on the boring observations, we anticipate that groundwater will be encountered during the removal of existing fill within the firehouse building footprint. Proper groundwater control measures will be required during construction (i.e. sumps and pumps).

We anticipate that the use of sump pits and pumps for dewatering will be effective where the groundwater level is within one (1) or two (2) feet of the planned bottom of the excavation. Where utilized for temporary groundwater control, the sumps shall consist of a perforated pipe at least eight (8) inches in diameter, surrounded by crushed stone and filter fabric. The sump pits shall be installed just outside the excavation area and at least two (2) to three (3) feet below the lowest anticipated subgrade elevation. The sumps and pumps must be set and in operation prior to excavation. The pumps shall be used to temporarily lower the surrounding groundwater level and keep the excavation relatively dry. Electric pumps equipped with an automatic shut off and capable of operating 24 hours a day are recommended. Swales and ditches could be constructed to collect and direct the water seepage to the sump pits.

#### Handling Wet and Sensitive Subgrades

In the event that the exposed subgrade soil within the planned building area is wet or soft, stabilizing the subgrade surface will be required in order to place new structural fill and to

construct the foundations and floor slab. The subgrade should be stabilized with geotextile filter fabric and crushed stone.

To prepare the subgrade surface for the geotextile filter fabric and new fill, all surface water and soft soil should be removed from the limits of the excavation, extending a minimum of three (3) feet beyond the new building limits where practical. Sump pits and pumps should be used to remove the standing water and to control the groundwater during construction. An over-excavation of 12 to 18 inches may be required.

After the subgrade is approved by Carlin-Simpson & Associates or a qualified geotechnical engineer, the geotextile filter fabric should be laid out on the exposed subgrade. The geotextile filter fabric shall consist of Mirafi 500X or equivalent. Adjacent layers of geotextile filter fabric should be overlapped a minimum of 6 inches. As necessary, approximately 12 to 18 inches of 3/4-inch clean crushed stone will be installed on top of the filter fabric layer to provide a firm working surface, provide protection for the geotextile filter fabric, and minimize pumping of the subgrade soil.

The stone should be spread across the geotextile filter fabric and densified with lightweight tracked equipment. Care should be taken to avoid contact of the tracked equipment with the geotextile fabric. Alternatively, the placement of the stone fill could be achieved by placing the material with the bucket of a large excavator and densifying the material with a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent). If subgrade pumping does occur, the filling operation should be halted until Carlin-Simpson & Associates or a qualified geotechnical engineer can evaluate the cause of the instability and make further recommendations.

#### Bedrock Special Construction Procedures

Based on the boring observations, bedrock is not expected to be encountered above the foundation subgrade elevations for the proposed buildings. In the event that weathered rock is encountered in isolated areas, "Special Construction Procedures" may be required. This will be determined by Carlin-Simpson & Associates or a qualified geotechnical engineer during construction. When continuous wall footings or closely spaced column footings (20 feet or less) bear on dissimilar material (i.e. rock and soil) the potential for differential movement exists. A footing bearing in rock will not move, whereas a footing bearing on soil will settle slightly due to the compressive nature of all soils when subjected to new loads. The area between movement and non-movement will develop a (shear) stress point. Cracks in foundations and walls will be the result from such movement. Therefore, continuous wall footings must bear either entirely on rock or entirely on soil for any individual structure. Alternatively, for larger structures, transition zones can be constructed to create a gradual transition from a soil to a rock bearing subgrade.

In the event that rock and soil both exist at the bearing elevation in a foundation excavation, the footings must either be lowered to bear entirely on rock, or a minimum of 18 inches of rock must be removed from below planned footing bottom. The over-excavated 18 inches must then be filled with a granular material having a maximum particle size of 1/2-inch and containing at least 10% but not more than 30% material by weight passing a No. 200 sieve. The fill shall be placed in six (6) inch layers and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557). This procedure will create a "cushion" atop the rock and reduce the potential for differential movement. For soft, rippable rock, this procedure will not be required.



Adjacent column footings greater than 20 feet apart may bear on dissimilar material (i.e. soil and rock). Any individual column footing must bear entirely on the same type bearing material (i.e. all soil or all rock). In addition, new footings constructed on sloping bedrock must be keyed into the bedrock surface.

If during the excavation for continuous foundations, the transition from soil to rock is gradual (i.e. from medium dense soil to dense weathered rock to very dense rock) over a distance of 20 feet or more, the “Special Construction Procedures” may not be required. This would have to be evaluated in the field on a case-by-case basis by the representative from Carlin-Simpson & Associates or a qualified geotechnical engineer at the time of construction.

### **5.2.2 Foundation Design Parameters**

Once the planned building areas have been prepared as described above, the new foundations may be constructed on the virgin site soils, new compacted fill, or completely weathered rock.

The new building foundations may be designed as shallow spread footings using net design bearing pressures as listed in Table 2 below. All of the exterior footings shall bear at the minimum depth listed below for protection from frost. Interior column footings may bear on the virgin soil or new structural fill just below the floor slabs provided the structures are heated during winter. The footings shall have minimum dimensions as listed below.

**Table 2 – Building Foundation Design Parameters**

| <b>Description</b>          | <b>Value</b>                                               |
|-----------------------------|------------------------------------------------------------|
| Foundation Bearing Material | Virgin Soil, New Compacted Fill, Completely Weathered Rock |
| Net Design Bearing Pressure | 4,000 psf                                                  |
| Minimum Frost Depth         | 42 inches                                                  |
| Minimum Column Dimension    | 30 inches                                                  |
| Minimum Wall Dimension      | 18 inches                                                  |

The excavations for the new foundations shall be performed under the full-time inspection of Carlin-Simpson & Associates or a qualified geotechnical engineer. The on-site representative shall confirm that the foundation bearing material is capable of supporting the design bearing pressure.

Prior to the placement of formwork, reinforcement steel, and concrete, the bearing subgrade soil shall be cleaned of all loose soil and where soil is encountered at the subgrade elevation, it shall be compacted with several passes of a small vibratory drum trench compactor (i.e. Wacker Model RT560), a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent), or “jumping jack” style tamper (i.e. Wacker Model BS 600). This must be performed under the observation of Carlin-Simpson & Associates or a qualified geotechnical engineer. If instability is observed during the compaction of the bearing subgrade, the soft soil shall be removed and replaced with new compacted fill.

### 5.2.3 Floor Slab on Grade

New fill for the floor slabs shall consist of either suitable on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% material by weight passing a No. 200 sieve. The new fill shall be placed in layers not exceeding one (1) foot in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). Fill layers shall be compacted, tested, and approved before placing subsequent layers.

The floor slabs may be designed as a slab on grade bearing on virgin soil or new engineer-approved structural fill. Floor slab design parameters are provided in Table 3 below. A minimum of 6 inches of 3/4-inch crushed stone is recommended beneath the concrete slabs for additional support and drainage.

**Table 3 – Building Floor Slab Design Parameters**

| <b>Description</b>               | <b>Value</b>                                 |
|----------------------------------|----------------------------------------------|
| Slabs Subgrade Material          | Densified Virgin Soil or New Structural Fill |
| Modulus of Subgrade Reaction (k) | 200 pci                                      |
| Crushed Stone Cushion Thickness  | 6 inches                                     |

### 5.3 Foundation Alternative #2 – Ground Improvement

As an alternative to completely removing the existing fill from the building areas with possible construction dewatering and replacing it with new compacted fill, the existing fill stratum could be improved with the use of ground improvement methods. A rammed aggregate pier (RAP) system or rapid impact compaction (RIC) could be considered for this project. After the building subgrade is improved, the new structure foundations and floor slabs may bear on the improved subgrade.

#### Rammed Aggregate Piers (RAP) Option

The RAP foundation system (such as the Geopier system) is not a pile foundation system. It is a proprietary ground improvement system consisting of columns of compacted stone that are used to strengthen subsoils for settlement control and for bearing capacity improvement.

We anticipate that Geopier's Impact® system may be suitable for this project. The Geopier Impact system creates RAP elements using a patented displacement mandrel to reinforce the underlying soils. The RAP elements are constructed by driving the mandrel and tamper foot into the ground to the design bearing depth. The displacement process allows for installation with no spoils and eliminates the need for casing of the RAP element hole to prevent collapse. Dense graded aggregate or clean crushed stone is placed into the hopper at the top of the hollow mandrel. The hollow mandrel is withdrawn approximately three feet allowing the aggregate to discharge at the bottom of the mandrel. The tamper is then driven back down two feet, which compacts the stone in approximate 12-inch lifts. Compaction is achieved through static down force and dynamic vertical ramming from the hammer. The beveled tamper head densifies the aggregate vertically and expands the stone bulb horizontally which increase the lateral confining stress on the soil cavity. The vertical and lateral displacement properties of this method result in stiff bearing elements as well as improved surrounding soils. The Impact System may require pre-augering due to the presence of debris and boulders in the existing fill.

The Geopier RAP systems are proprietary Geopier designs that must be designed by a licensed Geopier foundation installer. The designer will develop the required RAP system, RAP element diameter and spacing, and allowable foundation loads to limit total settlement to less than 1 inch and differential settlement to less than ½ inch.

We anticipate that the RAP system will allow the new foundations to be designed as shallow spread foundations bearing on the improved subgrade with an allowable bearing capacity of 4,000 to 6,000 psf. We also anticipate that the ground improvement will allow for the new floor slabs to be designed as slabs on grade. The final RAP system design and the allowable bearing capacity will be determined by the Geopier designer with input from Carlin-Simpson & Associates.

#### *Rapid Impact Compaction (RIC) Option*

Rapid impact compaction (RIC) may also be used to densify the existing fill in-place for support of the building foundations and floor slabs. RIC is a ground improvement method that uses a weight dropping from a controlled height onto a patented foot. Energy is transferred to the ground safely and efficiently as the RIC foot remains in contact with the ground. The compaction points are laid out in a grid pattern and multiple blows are applied at each point. Multiple passes will also be required to assure uniform densification of the soil layers.

If used, the RIC will result in craters on the site. Therefore, imported fill material will be required to level the site and to raise grades to the planned subgrade elevations. New fill required to achieve the planned subgrade elevations shall consist of suitable imported fill as described previously and shall be placed as compacted fill after the RIC has been completed.

Because RIC provides a low magnitude of impact loading at a very high frequency, the peak particle velocity (PPV) remains relatively low (less than 2 inches per second) at a distance of 30 feet from the drop point. This means that densification can be performed closer to property lines, adjacent structures, and/or existing utilities than other methods, such as deep dynamic compaction.

Based on our experience and the site conditions, we expect that the RIC program can be designed in a manner that will not detrimentally affect nearby structures. However, vibrations may be felt in the area surrounding the site. Because of the ground vibrations generated during RIC, the process must be closely monitored by a seismologist using a seismograph to ensure that the recommended peak particle velocities are not exceeded and nearby structures are not adversely affected. RIC must also be conducted prior to the excavation for new foundations or the installation of new utilities on the site. This is necessary to prevent damage to these items as a result of the RIC process.

The RIC program shall be designed by a New York State licensed professional engineer. Shop drawings and a work plan shall be submitted to Carlin-Simpson & Associates for review.

Once the building subgrade has been improved, the new foundations may be designed as shallow spread foundations bearing on the improved subgrade soil with an allowable bearing capacity of 2,000 psf. In addition, the floor slab can be designed as a slab on grade bearing on the improved subgrade soil. The other foundation and floor slab design parameters presented in Table 2 and Table 3 above are still applicable in this case.

## 5.4 Settlement

Settlement of individual footings, designed in accordance with recommendations presented in this report, is expected to be within tolerable limits for the proposed structure. For footings placed on natural soils or new engineer-approved compacted fill and constructed in accordance with the requirements outlined in this report, maximum total settlement is expected to be on the order of 1-inch or less. Maximum differential settlement between adjacent columns or load bearing walls is expected to be ½-inch or less.

The above settlement values are based on our engineering experience with similar soil conditions and the anticipated structural loading. These estimated settlements are intended to guide the structural engineer with their design. It is critical that Carlin-Simpson & Associates or a qualified geotechnical engineer be retained to observe the foundation bearing surfaces and to confirm the recommended bearing pressures during construction.

## 5.5 Seismic Design Considerations

From site-specific test boring data, the Site Class was determined from New York State Building Code Section 1613.2.2. The site-specific data used to determine the Site Class typically includes soil test borings to determine Standard Penetration resistances (N-values). Based on estimated average N-values in the upper 100 feet of soil profile, the site can be classified as Site Class C – Very Dense Soil and Soft Rock Profile.

New structures should be designed to resist stress produced by lateral forces computed in accordance with Section 1613 of the New York State Building Code. The values in Table 4 shall be used for this project.

**Table 4 – Seismic Design Values**

| <b>Description</b>                                                           | <b>Value</b>    |
|------------------------------------------------------------------------------|-----------------|
| Mapped Spectral Response Acceleration for Short Periods, [Fig 1613.2.1 (1)]  | $S_S=0.242g$    |
| Mapped Spectral Response Acceleration at 1-Second Period, [Fig 1613.2.1 (2)] | $S_1=0.058g$    |
| Site Coefficient [Table 1613.2.3 (1)]                                        | $F_a= 1.30$     |
| Site Coefficient [Table 1613.2.3 (2)]                                        | $F_v= 1.50$     |
| Max Considered Earthquake Spectral Response for Short Periods [Eq 16-36]     | $S_{MS}=0.314g$ |
| Max Considered Earthquake Spectral Response at 1-Second Period [Eq 16-37]    | $S_{M1}=0.086g$ |
| Design Spectral Response Acceleration for Short Periods [Eq 16-38]           | $S_{DS}=0.209g$ |
| Design Spectral Response Acceleration for 1-Second Period [Eq 16-39]         | $S_{D1}=0.058g$ |

## 6.0 SITE EVALUATION

Our recommendations for the proposed site development including new underground utilities, new pavement for driveways and parking areas, temporary construction excavations, and the suitability of the existing site soils for reuse as structural fill are provided below. A summary of the boring observations are provided in Table 1 above.

## **6.1     Utilities**

New utilities may bear in the densified existing fill, virgin site soils, new compacted fill, completely weathered rock, or bedrock. The bottom of all trenches should be excavated clean and shaped so a hard bottom is provided for the pipe support. If any soft or unsuitable soil conditions are encountered during construction, the unsuitable materials must be removed and replaced with new compacted fill.

In the event that weathered rock is encountered in the utility excavations, it must be removed to at least six (6) inches below planned pipe invert. The over-excavated six (6) inches shall then be filled with new sandy fill and compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557) to act as a cushion on the rock. Depending on the proposed utility invert elevations, trench hammering may be required in areas.

For areas where existing fill is encountered within the utility excavations, the subgrade at bottom of the utility excavation shall be compacted in place with a vibratory drum trench compactor or “jumping jack” style tamper. Carlin-Simpson & Associates or a qualified geotechnical engineer must evaluate these areas for the presence of soft or unsuitable material within the existing fill matrix. If instability is observed, portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates or the qualified geotechnical engineer will determine this during construction.

In the event that the trench bottom becomes soft due to the inflow of surface or trapped water, the soft soil shall be removed and the excavation filled with a minimum of six (6) inches of 3/4-inch clean crushed stone to provide a firm base for support of the pipe. Sump pits and pumps should be adequate to keep the excavations dry.

After the utility is installed, the trench must be backfilled with compacted fill. The fill shall consist of suitable on-site soil or imported sand and gravel. Imported fill shall contain less than 20% by weight passing a No. 200 sieve. Large rock fragments and boulders must not be placed directly against the pipe. Controlled compacted fill shall be placed in one (1) foot loose layers and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). The backfill must be free of topsoil, debris, and large boulders or rock fragments.

## **6.2     Pavement**

We understand that the proposed construction will also include new paved driveways and parking areas. The densified existing fill, virgin soil, and new compacted fill may be used to support the pavement.

To prepare the new pavement areas, the existing surface materials (i.e. topsoil, vegetation, etc.) must be removed from the planned pavement areas. In the proposed pavement areas, the existing structures and debris resulting from the demolition of these structures must be completely removed from the new pavement area, extending at least five (5) feet beyond the new paving limits, where practical. After all debris has been removed, the exposed subgrade soil that is either at or below the planned subgrade elevation shall be proofrolled with a large vibratory drum roller (i.e. Dynapac 250 or equivalent) to densify the underlying soils. The on-site representative from Carlin-Simpson & Associates or a qualified geotechnical engineer shall witness the proofrolling

operation. If any excessive movement is noted during the proofrolling, the soft or unsuitable soil shall be removed and replaced with new compacted fill.

Areas where existing fill is encountered shall be compacted in place. Carlin-Simpson & Associates or a qualified geotechnical engineer must evaluate these areas for the presence of soft or unsuitable material within the existing fill matrix. Portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates or the qualified geotechnical engineer will determine this during construction.

Where new fill is required to achieve final grades, it shall consist of either suitable on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% by weight passing a No. 200 sieve. New fill shall be placed in layers not exceeding one (1) foot in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557).

#### Asphalt Pavement Section

After the planned subgrade has been proofrolled and new compacted fill has been placed as required, the new pavement subbase may be placed on the densified site soils and new compacted fill. A minimum of six (6) inches of dense graded aggregate (DGA) is recommended for the subbase layer for drainage and additional pavement support.

We recommend that the following pavement sections be used for the site. These pavement sections are subject to local government approval.

##### Light Duty – Parking Lots

|      |                                                |                 |
|------|------------------------------------------------|-----------------|
| 1.5" | Asphalt Top Course                             | NYSDOT, Type 6F |
| 3"   | Asphalt Base Course                            | NYSDOT, Type 3  |
| 6"   | Stone Subbase (DGA)                            | NYSDOT, Type 1  |
|      | Approved Compacted Subgrade (Minimum CBR = 10) |                 |

##### Heavy Duty – Driveways

|    |                                                |                 |
|----|------------------------------------------------|-----------------|
| 2" | Asphalt Top Course                             | NYSDOT, Type 6F |
| 4" | Asphalt Base Course                            | NYSDOT, Type 3  |
| 8" | Stone Subbase (DGA)                            | NYSDOT, Type 1  |
|    | Approved Compacted Subgrade (Minimum CBR = 10) |                 |

Based on the boring data, we anticipate that the densified existing site soils and new compacted fill will provide a CBR value that is equal to or greater than 10, which can adequately support the above pavement sections.

#### Rigid (Concrete) Pavement

We expect that the proposed construction may also include rigid concrete pavement in portions of the site. The rigid concrete pavement section design below is based on a 20-year design life and the anticipated fire truck traffic data. This pavement section is subject to local government approval.

|    |                                                |               |
|----|------------------------------------------------|---------------|
| 6" | Concrete Section                               | 4,000 psi     |
| 8" | Gravel Subbase Course                          | NYSDOT Type 4 |
|    | Approved Compacted Subgrade (Minimum CBR = 10) |               |

The rigid concrete pavement should be reinforced with welded wire fabric or reinforcing steel bars for crack control. Contraction joints should also be provided with a maximum spacing of 10 feet. The project structural engineer or the site engineer shall determine the type, size, and spacing of the reinforcement based on the anticipated loading.

### **6.3 Temporary Construction Excavations and Excavation Protection**

Temporary construction excavations shall be conducted in accordance with the most recent OSHA guidelines or applicable federal, state or local codes. A qualified person should evaluate the excavations at the time of construction to determine the appropriate soil or rock type and the allowable slope configuration. Based on the boring data, we believe the site soil and bedrock would have the following classifications as defined by the OSHA guidelines.

| <u>Soil/ Rock Type</u>        | <u>Possible Classification</u> | <u>Maximum Slope or Bench</u> |
|-------------------------------|--------------------------------|-------------------------------|
| Existing Fill                 | "C"                            | 1½H:1V                        |
| Virgin Soil/Improved Subgrade | "B"                            | 1H:1V                         |

Temporary support (i.e. trench boxes, sheeting and shoring, etc.) should be used for any excavation that cannot be sloped or benched in accordance with the applicable regulations, where necessary to protect adjacent property, utilities, driveways, and/or structures, or where saturated soils or water seepage is encountered within the excavation. In the event that water is encountered within the excavation, an evaluation of the excavation's stability must be performed. Perched water or groundwater encountered within the excavation will destabilize the sides of the excavation. Temporary support will be required to stabilize the excavation. Dewatering of the excavation will also be required.

A New York State licensed professional engineer must design all temporary and permanent support systems. The contractor will select the shoring type and submit design calculations for the proposed shoring method to Carlin-Simpson & Associates for review.

The soil adjacent to the temporary support system will exert a horizontal pressure against the system. This pressure is based on the soil unit weight, coefficient of active earth pressure, and depth of the excavation. In addition, the surcharge loads from adjacent driveways, construction equipment, or stored materials near the excavation must be incorporated into the design of the support system, as applicable. The design parameters for temporary excavation support systems are listed in Table 5 below.

**Table 5 – Temporary Sheet piling and Shoring Design Parameters**

| <b>Description</b>                                       | <b>Soil Value</b> |
|----------------------------------------------------------|-------------------|
| Moist Unit Weight (pcf)                                  | 130               |
| Friction Angle ( $\phi$ , deg)                           | 30                |
| Cohesion (c, psf)                                        | 0                 |
| Active Earth Pressure Coefficient ( $k_a$ ) <sup>1</sup> | 0.33              |

| Description                                               | Soil Value |
|-----------------------------------------------------------|------------|
| Equivalent Fluid Pressure (pcf)                           | 42.9       |
| Passive Earth Pressure Coefficient ( $k_p$ ) <sup>1</sup> | 3.0        |

#### **6.4 Suitability of the In-Situ Soil and Rock for Use as Compacted Fill**

The suitability of each stratum for use as compacted fill is discussed below.

**Stratum 2**  
Existing Fill      The existing fill generally consists of loose to medium dense brown, gray, black coarse to fine SAND, little (to and) Silt, little (to and) coarse to fine Gravel. Debris (i.e. ash, bricks, glass, and asphalt) was noted within this stratum. Cobbles and boulders were also encountered within this stratum at select locations. In boring B-1, a layer within the fill stratum consists of black SILT some, coarse to fine Sand, little coarse to fine Gravel. The existing fill is generally suitable for reuse, as long as it remains relatively dry for optimum compaction and all the debris is removed prior to reuse as compacted fill. The moderate to high silt content material will be moisture sensitive and may be difficult to reuse as compacted fill.

**Stratum 3**  
Silty Sand  
with Gravel      The silty sand with gravel consists of medium dense to dense brown coarse to fine SAND, little (to some) Silt, little (to some) coarse to fine Gravel. This stratum is generally suitable for reuse as compacted fill, as long as it remains relatively dry for optimum compaction.

**Stratum 4/5**  
Weathered  
Rock or  
Bedrock      Rock is not expected to be excavated during construction. In the event that completely weathered rock is excavated from select areas of the site, it may be used as fill material provided that the material is well graded and has been approved prior to use by Carlin-Simpson & Associates.

The boring data indicates that the on-site soils contain a varying percentage of silt (10% to greater than 50%). The higher silt content soils will be moisture sensitive. If the soil becomes too wet, it will be difficult to achieve adequate compaction. In addition, the site soils that extend below the groundwater table are completely saturated and are therefore, unsuitable for reuse.

Proper moisture conditioning of the soil will be required. New compacted fill should be within 2% (+/-) of its optimum moisture content at the time of placement. In the event that the on-site material is too wet at the time of placement and cannot be adequately compacted, the soil should be aerated and allowed to dry or the material removed and a drier cleaner fill material used. In the event that the on-site material is too dry at the time of placement and cannot be adequately compacted, water may be needed to increase the soil moisture content for proper compaction.

The in-situ soils which exist throughout the site may become soft and weave if exposed to excessive moisture and construction traffic. The instability will occur quickly when exposed to these elements and it will be difficult to stabilize the subgrade. We recommend that adequate site drainage be implemented early in the construction schedule and if the subgrade becomes wet, the contractor should limit construction activity until the soil has dried.



The minimum compaction requirements for the various areas of the site are summarized in Table 6 below.

**Table 6 – Minimum Compaction Requirements**

| <b>Area</b>                  | <b>Maximum Modified Dry Density<br/>(ASTM D1557)</b> |
|------------------------------|------------------------------------------------------|
| Below Foundations            | 95%                                                  |
| Below Floor Slabs            | 92%                                                  |
| Pavement Areas               | 92%                                                  |
| Exterior Slabs and Sidewalks | 92%                                                  |
| Utility Trenches             | 92%                                                  |
| Landscape Areas              | 90%                                                  |

## **7.0 GENERAL**

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study and our past experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for Carlin-Simpson & Associates to review the information, reassess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings and test pits will differ from those encountered at specific boring or test pit locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this geotechnical report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, Carlin-Simpson & Associates should be retained by the owner to observe all earthwork and foundation construction, to document that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations. Carlin-Simpson & Associates is not responsible or liable for the conclusions and recommendations presented in this report if Carlin-Simpson & Associates does not perform the observation and testing services.

Therefore, in order to preserve continuity in this project, the owner shall retain the services of Carlin-Simpson & Associates to provide full time geotechnical related monitoring and testing during construction. At a minimum, this shall include the observation and testing of the following: 1) the removal of existing fill and unsuitable soil, where required; 2) the proofrolling of the subgrade soil prior to the placement of new compacted fill; 3) the placement and compaction

of controlled fill; 4) the excavation for the new foundations; 5) ground improvement methods, if used; and 6) the preparation of the subgrade for the floor slabs and pavement areas.

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. Carlin-Simpson & Associates should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed. Should the nature of the project change, these recommendations should be re-evaluated.

This report is provided for the exclusive use of H2M Architects + Engineers. and the project specific design team and may not be used or relied upon in connection with other projects or by other third parties. Carlin-Simpson & Associates disclaims liability for any such third-party use or reliance without express written permission. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. Carlin-Simpson & Associates is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

If the conditions encountered during construction vary significantly from those stated in this report, this office should be notified immediately so that additional recommendations can be made.

Thank you for allowing us to assist you with this project. Should you have any questions or comments, please contact this office.

Very truly yours,

CARLIN-SIMPSON & ASSOCIATES



CATHERINE K. SIMPSON, E.I.T.  
Project Manager



ROBERT B. SIMPSON, P.E.






GENERAL NOTES:

1. GENERAL LAYOUT WAS OBTAINED FROM A DRAWING THAT WAS PREPARED BY H2M ARCHITECHS AND ENGINEERS, ENTITLED "SOIL BORING PLAN", DATED 13 NOVEMBER 2020, DRAWING NUMBER SB 100.00.
2. BORING WERE LAID OUT IN THE FIELD BY CARLIN-SIMPSON & ASSOCIATES (CSA).
3. THE BORINGS WERE PERFORMED BY GENERAL BORINGS, INC. IN JANUARY 2021 UNDER THE FULL TIME INSPECTION OF CSA.
4. LOCATIONS ARE APPROXIMATE.

LEGEND:

 - BORING LOCATION

| ROBERT B. SIMPSON, P.E.<br>PROFESSIONAL ENGINEER                                     |                     |                                                                                                                                                                                                                                |  |
|--------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| _____<br>LICENSE NO.                                                                 |                     | _____<br>SIGNATURE                                                                                                                                                                                                             |  |
| _____<br>DATE                                                                        |                     |                                                                                                                                                                                                                                |  |
| BORING LOCATION PLAN                                                                 |                     |                                                                                                                                                                                                                                |  |
| PROPOSED BUILDING - NEW FIREHOUSE<br>872 BLOOMING GROVE TPK<br>NEW WINDSOR, NEW YORK |                     |                                                                                                                                                                                                                                |  |
| DRAWN<br>NJA                                                                         | SCALE<br>1" = 50'   | CARLIN-SIMPSON AND ASSOCIATES<br>61 Main Street<br>Sayreville, NJ 08872<br><br>Consulting Geotechnical and<br>Environmental Engineers<br> |  |
| CHECKED<br>RBS                                                                       | DATE<br>10 FEB 2021 |                                                                                                                                                                                                                                |  |
| PROJECT NO.<br>20-226                                                                | DWG NO.<br>FIG -1   |                                                                                                                                                                                                                                |  |
| APPROVED                                                                             |                     |                                                                                                                                                                                                                                |  |

| CARLIN-SIMPSON & ASSOCIATES<br>Sayreville, NJ                                    |                                |                  |                                       | TEST BORING LOG |                                                                                          |        |        |      | BORING NUMBER<br>B-1 |                                                          |  |
|----------------------------------------------------------------------------------|--------------------------------|------------------|---------------------------------------|-----------------|------------------------------------------------------------------------------------------|--------|--------|------|----------------------|----------------------------------------------------------|--|
| Project: Proposed Building/New Firehouse, 872 Blooming Grove Tpk, New Windsor NY |                                |                  |                                       |                 |                                                                                          |        |        |      | SHEET NO.: 1 of 1    |                                                          |  |
| Client: H2M Architects + Engineers                                               |                                |                  |                                       |                 |                                                                                          |        |        |      | JOB NUMBER: 20-226   |                                                          |  |
| Drilling Contractor: General Borings Inc.                                        |                                |                  |                                       |                 |                                                                                          |        |        |      | ELEVATION: -         |                                                          |  |
| GROUNDWATER                                                                      |                                |                  |                                       |                 | CASING                                                                                   | SAMPLE | CORE   | TUBE | DATUM: -             |                                                          |  |
| DATE                                                                             |                                | TIME             | DEPTH                                 | CASING          | TYPE                                                                                     | HSA    | SS     |      |                      | START DATE: 13/Jan/21                                    |  |
| 13/Jan/21                                                                        |                                | 1545             | 6'0"                                  | HSA             | DIA.                                                                                     | 3 1/4" | 1 3/8" |      |                      | FINISH DATE: 13/Jan/21                                   |  |
|                                                                                  |                                |                  |                                       |                 | WGHT                                                                                     |        | 140#   |      |                      | DRILLER: J Wyant                                         |  |
|                                                                                  |                                |                  |                                       |                 | FALL                                                                                     |        | 30"    |      |                      | INSPECTOR: JP                                            |  |
| Depth<br>(ft.)                                                                   | Casing<br>Blows<br>per<br>Foot | Sample<br>Number | Blows on<br>Sample<br>Spoon per<br>6" | Sym             | IDENTIFICATION                                                                           |        |        |      |                      | REMARKS                                                  |  |
| 1                                                                                |                                | S-1              |                                       |                 | Asphalt 0'4"                                                                             |        |        |      |                      | Rec = 7"<br>moist                                        |  |
|                                                                                  |                                |                  | 9                                     |                 | FILL (Black SILT some, coarse to fine Sand,<br>little coarse to fine Gravel, with brick) |        |        |      |                      |                                                          |  |
| 2                                                                                |                                |                  | 4                                     |                 | FILL (Bk \$ s, cf S, l cf G, w/brick) 2'6"                                               |        |        |      |                      |                                                          |  |
| 3                                                                                |                                | S-2              | 3                                     |                 |                                                                                          |        |        |      |                      | Rec = 11"<br>moist                                       |  |
|                                                                                  |                                |                  | 21                                    |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 4                                                                                |                                |                  | 11                                    |                 | FILL (Br, gr cf S, s \$, l (+) cf G                                                      |        |        |      |                      |                                                          |  |
| 5                                                                                |                                | S-3              | 9                                     |                 |                                                                                          |        |        |      |                      | Rec = 13"<br>moist                                       |  |
|                                                                                  |                                |                  | 10                                    |                 | FILL (Brown, gray coarse to fine SAND,<br>some Silt, little (+) coarse to fine Gravel)   |        |        |      |                      |                                                          |  |
| 6                                                                                |                                |                  | 5                                     |                 | FILL (same, mttld br, gr, or cf G a (+), cf S, s (+) \$)                                 |        |        |      |                      |                                                          |  |
| 7                                                                                |                                | S-4              | 6                                     |                 |                                                                                          |        |        |      |                      | Rec = 6"<br>wet                                          |  |
|                                                                                  |                                |                  | 5                                     |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 8                                                                                |                                |                  | 5                                     |                 | FILL (same, l \$, a cf G) 8'6"                                                           |        |        |      |                      |                                                          |  |
| 9                                                                                |                                | S-5              | 8                                     |                 |                                                                                          |        |        |      |                      | Rec = 10"<br>wet                                         |  |
|                                                                                  |                                |                  | 11                                    |                 | Brown coarse to fine SAND,<br>some (-) Silt, some (+) coarse to fine Gravel              |        |        |      |                      |                                                          |  |
| 10                                                                               |                                |                  | 15                                    |                 | Br cf S, s (-) \$, s (+) cf G 12'0"                                                      |        |        |      |                      |                                                          |  |
| 11                                                                               |                                |                  | 50/5"                                 |                 | End of Boring @ 12'0"                                                                    |        |        |      |                      | Rock in tip<br>Auger refusal @ 12'0"<br>probable bedrock |  |
| 12                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 13                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 14                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 15                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 16                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 17                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 18                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 19                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 20                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 21                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |
| 22                                                                               |                                |                  |                                       |                 |                                                                                          |        |        |      |                      |                                                          |  |

| CARLIN - SIMPSON & ASSOCIATES<br>Sayreville, N.J.                                |                                |                  |                                       | TEST BORING LOG                                                                                                                                                  |        |        |      |      | BORING NUMBER<br>B-2                                          |  |
|----------------------------------------------------------------------------------|--------------------------------|------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|------|------|---------------------------------------------------------------|--|
| Project: Proposed Building/New Firehouse, 872 Blooming Grove Tpk, New Windsor NY |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      | SHEET NO.: 1 of 1                                             |  |
| Client: H2M Architects + Engineers                                               |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      | JOB NUMBER: 20-226                                            |  |
| Drilling Contractor: General Borings Inc                                         |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      | ELEVATION: -                                                  |  |
| GROUNDWATER                                                                      |                                |                  |                                       |                                                                                                                                                                  | CASING | SAMPLE | CORE | TUBE | DATUM: -                                                      |  |
| DATE                                                                             | TIME                           | DEPTH            | CASING                                | TYPE                                                                                                                                                             | HSA    | SS     | DBL  |      | START DATE: 13 Jan 21                                         |  |
| 1/13/2021                                                                        | 0930                           | 5'6"             | HSA                                   | DIA.                                                                                                                                                             | 3 1/4" | 1 3/8" | 2"   |      | FINISH DATE: 13 Jan 21                                        |  |
|                                                                                  |                                |                  |                                       | WGHT                                                                                                                                                             |        | 140#   |      |      | DRILLER: J Wyant                                              |  |
|                                                                                  |                                |                  |                                       | FALL                                                                                                                                                             |        | 30"    |      |      | INSPECTOR: JP                                                 |  |
| Depth<br>(ft.)                                                                   | Casing<br>Blows<br>pre<br>Foot | Sample<br>Number | Blows on<br>Sample<br>Spoon<br>per 6" | IDENTIFICATION                                                                                                                                                   |        |        |      |      | REMARKS                                                       |  |
| 1                                                                                |                                | S-1              |                                       | Asphalt 0'7"                                                                                                                                                     |        |        |      |      | Rec = 10"<br>moist                                            |  |
| 2                                                                                |                                |                  | 7                                     | FILL (Gr cf S, s \$, l cf G, w/glass<br><br><u>FILL (Gray coarse to fine SAND, some Silt,<br/>little coarse to fine Gravel, with glass)</u><br>FILL (same, a \$) |        |        |      |      |                                                               |  |
| 3                                                                                |                                |                  | 5                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 4                                                                                |                                | S-2              | 7                                     | Gr cf S, l (+) \$, l (+) cf G                                                                                                                                    |        |        |      |      | Rec = 17"<br>moist                                            |  |
| 5                                                                                |                                |                  | 5                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 6                                                                                |                                |                  | 7                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 7                                                                                |                                | S-3              | 6                                     | same, s (+) \$, a (-) mf G<br><br><u>Gray coarse to fine SAND, little (+) Silt,<br/>some (+) coarse to fine Gravel</u>                                           |        |        |      |      | Rec = 4"<br>moist                                             |  |
| 8                                                                                |                                |                  | 7                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 9                                                                                |                                |                  | 4                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 10                                                                               |                                | S-4              | 2                                     | same, br, gr s (+) \$                                                                                                                                            |        |        |      |      | Rec = 8"<br>wet                                               |  |
| 11                                                                               |                                |                  | 3                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 12                                                                               |                                |                  | 2                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 13                                                                               |                                | S-5              |                                       | Boulders 14'0"                                                                                                                                                   |        |        |      |      | Run #1<br>13'0"-18'0"<br>Run = 60"<br>Rec = 100%<br>RQD = 45% |  |
| 14                                                                               |                                |                  | 3                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 15                                                                               |                                |                  | 5                                     |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 16                                                                               |                                | Run<br>#1        | 8                                     | <u>Gray limestone and shale, shattered,<br/>very blocky and seamy weathered rock</u>                                                                             |        |        |      |      | 18'0"                                                         |  |
| 17                                                                               |                                |                  | 10                                    |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 18                                                                               |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 19                                                                               |                                |                  |                                       | <u>End of Boring @ 18'0"</u>                                                                                                                                     |        |        |      |      |                                                               |  |
| 20                                                                               |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 21                                                                               |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      |                                                               |  |
| 22                                                                               |                                |                  |                                       |                                                                                                                                                                  |        |        |      |      |                                                               |  |

|                                                                                  |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
|----------------------------------------------------------------------------------|--------------------------------|------------------|---------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CARLIN - SIMPSON & ASSOCIATES<br>Sayreville, N.J.                                |                                |                  |                                       | TEST BORING LOG |                                                                                                                                                              |        |        |      | BORING NUMBER<br>B-3 |                                                                                                                                                                                 |  |
| Project: Proposed Building/New Firehouse, 872 Blooming Grove Tpk, New Windsor NY |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      | SHEET NO.: 1 of 1    |                                                                                                                                                                                 |  |
| Client: H2M Architects + Engineers                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      | JOB NUMBER: 20-226   |                                                                                                                                                                                 |  |
| Drilling Contractor: General Borings Inc.                                        |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      | ELEVATION: -         |                                                                                                                                                                                 |  |
| GROUNDWATER                                                                      |                                |                  |                                       |                 | CASING                                                                                                                                                       | SAMPLE | CORE   | TUBE | DATUM: -             |                                                                                                                                                                                 |  |
| DATE                                                                             |                                | TIME             | DEPTH                                 | CASING          | TYPE                                                                                                                                                         | HSA    | SS     |      |                      | START DATE: 13 Jan 21                                                                                                                                                           |  |
|                                                                                  |                                | No Water Reading |                                       |                 | DIA.                                                                                                                                                         | 3 1/4" | 1 3/8" |      |                      | FINISH DATE: 13 Jan 21                                                                                                                                                          |  |
|                                                                                  |                                |                  |                                       |                 | WGHT                                                                                                                                                         |        | 140#   |      |                      | DRILLER: J Wyant                                                                                                                                                                |  |
|                                                                                  |                                |                  |                                       |                 | FALL                                                                                                                                                         |        | 30"    |      |                      | INSPECTOR: JP                                                                                                                                                                   |  |
| Depth<br>(ft.)                                                                   | Casing<br>Blows<br>pre<br>Foot | Sample<br>Number | Blows on<br>Sample<br>Spoon<br>per 6" | S<br>y<br>m     | IDENTIFICATION                                                                                                                                               |        |        |      |                      | REMARKS                                                                                                                                                                         |  |
| 1                                                                                |                                | S-1              |                                       |                 | <u>Asphalt</u> 0'3"                                                                                                                                          |        |        |      |                      | Rec = 5"<br>moist<br>Auger refusal. Moved 6' west<br>auger refusal 4'0". Moved 5'<br>south<br><br>Auger chewing through rock<br>or boulders<br><br>Weathered rock starting 8'0" |  |
| 2                                                                                |                                |                  | 5                                     |                 | FILL (Gr cf S, 1 \$, 1 (+) cf G)<br><br>Boulder<br><br><u>FILL (Gray coarse to fine SAND, little Silt,<br/>little (+) coarse to fine Gravel)</u><br><br>8'0" |        |        |      |                      |                                                                                                                                                                                 |  |
| 3                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 4                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 5                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 6                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 7                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 8                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 9                                                                                |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 10                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 11                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 12                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 13                                                                               |                                | Run<br>#1        |                                       |                 | <u>Gray sandstone and shale, crushed,<br/>completely weathered rock</u><br><br>17'0"                                                                         |        |        |      |                      |                                                                                                                                                                                 |  |
| 14                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 15                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 16                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 17                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 18                                                                               |                                |                  |                                       |                 | <u>End of Boring @ 17'0"</u>                                                                                                                                 |        |        |      |                      | Core barrel jammed                                                                                                                                                              |  |
| 19                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 20                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 21                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 22                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |
| 23                                                                               |                                |                  |                                       |                 |                                                                                                                                                              |        |        |      |                      |                                                                                                                                                                                 |  |

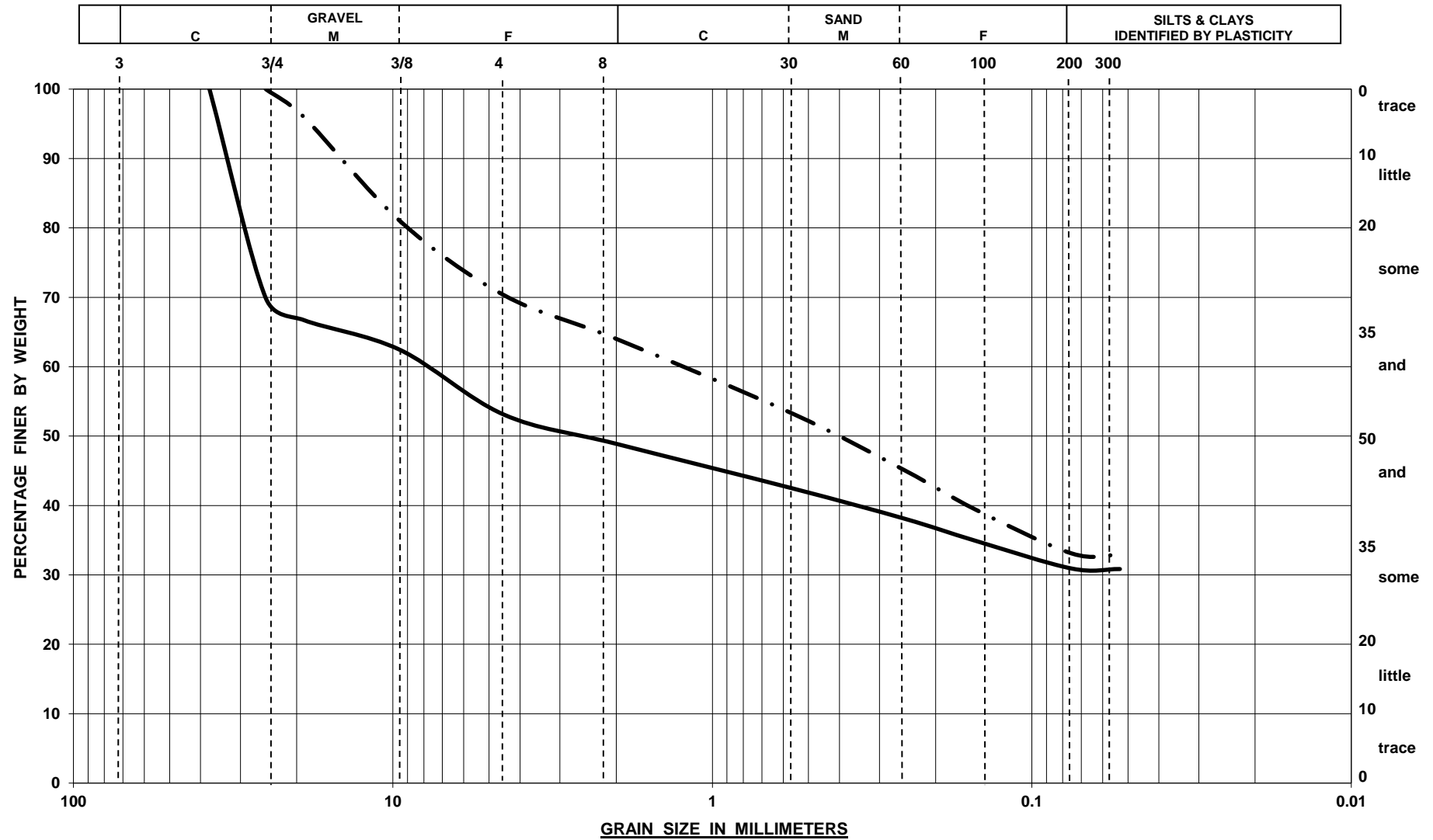
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|----------------------------------------------------------------------------------|--------------------------------|------------------|---------------------------------------|-----------------|--------------------------------------------------------------------------------|--------|------|------|------------------------|-----------------------|
| CARLIN-SIMPSON & ASSOCIATES<br>Sayreville, NJ                                    |                                |                  |                                       | TEST BORING LOG |                                                                                |        |      |      | BORING NUMBER<br>B-4   |                       |
| Project: Proposed Building/New Firehouse, 872 Blooming Grove Tpk, New Windsor NY |                                |                  |                                       |                 |                                                                                |        |      |      | SHEET NO.: 1 of 1      |                       |
| Client: H2M Architects + Engineers                                               |                                |                  |                                       |                 |                                                                                |        |      |      | JOB NUMBER: 20-226     |                       |
| Drilling Contractor: General Borings Inc.                                        |                                |                  |                                       |                 |                                                                                |        |      |      | ELEVATION: -           |                       |
| GROUNDWATER                                                                      |                                |                  |                                       |                 | CASING                                                                         | SAMPLE | CORE | TUBE | DATUM: -               |                       |
| DATE                                                                             | TIME                           | DEPTH            | CASING                                | TYPE            | HSA                                                                            | SS     |      |      | START DATE: 15/Jan/21  |                       |
| No Groundwater Encountered                                                       |                                |                  |                                       | DIA.            | 3 1/4"                                                                         | 1 3/8" |      |      | FINISH DATE: 15/Jan/21 |                       |
|                                                                                  |                                |                  |                                       | WGHT            |                                                                                | 140#   |      |      | DRILLER: T McGovern    |                       |
|                                                                                  |                                |                  |                                       | FALL            |                                                                                | 30"    |      |      | INSPECTOR: JP          |                       |
| Depth<br>(ft.)                                                                   | Casing<br>Blows<br>per<br>Foot | Sample<br>Number | Blows on<br>Sample<br>Spoon per<br>6" | S<br>y<br>m     | IDENTIFICATION                                                                 |        |      |      | REMARKS                |                       |
|                                                                                  |                                |                  | 5                                     |                 | Topsoil                                                                        |        |      |      | 0'2"                   |                       |
| 1                                                                                |                                | S-1              | 8                                     |                 | FILL (Br cf S, s (+) \$, s mf G)                                               |        |      |      |                        | Rec = 7"<br>moist     |
|                                                                                  |                                |                  | 14                                    |                 |                                                                                |        |      |      |                        |                       |
| 2                                                                                |                                |                  | 18                                    |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  | 7                                     |                 |                                                                                |        |      |      |                        |                       |
| 3                                                                                |                                | S-2              | 6                                     |                 | FILL (same)                                                                    |        |      |      |                        | Rec = 8"<br>moist     |
|                                                                                  |                                |                  | 5                                     |                 | FILL (Brown coarse to fine SAND,<br>some (+) Silt, some coarse to fine Gravel) |        |      |      |                        |                       |
| 4                                                                                |                                |                  | 8                                     |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 5                                                                                |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  | 23                                    |                 |                                                                                |        |      |      |                        |                       |
| 6                                                                                |                                | S-3              | 5                                     |                 | FILL (same, s cf G, w/ash or asphalt)                                          |        |      |      |                        | Rec = 9"<br>moist     |
|                                                                                  |                                |                  | 50/5"                                 |                 |                                                                                |        |      |      |                        |                       |
| 7                                                                                |                                |                  |                                       |                 |                                                                                |        |      |      | 6'11"                  |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 8                                                                                |                                |                  |                                       |                 | Shale, Completely Weathered                                                    |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 9                                                                                |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 10                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      | 10'0"                  | Auger refusal @ 10'0" |
|                                                                                  |                                |                  |                                       |                 | End of Boring @ 10'0"                                                          |        |      |      |                        |                       |
| 11                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 12                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 13                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 14                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 15                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 16                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 17                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 18                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 19                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 20                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 21                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
|                                                                                  |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |
| 22                                                                               |                                |                  |                                       |                 |                                                                                |        |      |      |                        |                       |

| CARLIN-SIMPSON & ASSOCIATES<br>Sayreville, NJ                                    |                       |               |                              | TEST BORING LOG |                                                                                                     |        |        |      | BORING NUMBER<br>B-5 |                                                                             |  |
|----------------------------------------------------------------------------------|-----------------------|---------------|------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|--------|--------|------|----------------------|-----------------------------------------------------------------------------|--|
| Project: Proposed Building/New Firehouse, 872 Blooming Grove Tpk, New Windsor NY |                       |               |                              |                 |                                                                                                     |        |        |      | SHEET NO.: 1 of 1    |                                                                             |  |
| Client: H2M Architects + Engineers                                               |                       |               |                              |                 |                                                                                                     |        |        |      | JOB NUMBER: 20-226   |                                                                             |  |
| Drilling Contractor: General Borings Inc.                                        |                       |               |                              |                 |                                                                                                     |        |        |      | ELEVATION: -         |                                                                             |  |
| GROUNDWATER                                                                      |                       |               |                              |                 | CASING                                                                                              | SAMPLE | CORE   | TUBE | DATUM: -             |                                                                             |  |
| DATE                                                                             |                       | TIME          | DEPTH                        | CASING          | TYPE                                                                                                | HSA    | SS     |      |                      | START DATE: 15/Jan/21                                                       |  |
| 15/Jan/21                                                                        |                       | 930           | 6'6"                         | HSA             | DIA.                                                                                                | 3 1/4" | 1 3/8" |      |                      | FINISH DATE: 15/Jan/21                                                      |  |
|                                                                                  |                       |               |                              |                 | WGHT                                                                                                |        | 140#   |      |                      | DRILLER: T McGovern                                                         |  |
|                                                                                  |                       |               |                              |                 | FALL                                                                                                |        | 30"    |      |                      | INSPECTOR: JP                                                               |  |
| Depth (ft.)                                                                      | Casing Blows per Foot | Sample Number | Blows on Sample Spoon per 6" | Sym             | IDENTIFICATION                                                                                      |        |        |      |                      | REMARKS                                                                     |  |
| 1                                                                                |                       | S-1           | 2                            |                 | <u>Topsoil</u>                                                                                      |        |        |      |                      | 0'5"                                                                        |  |
|                                                                                  |                       |               | 6                            |                 | FILL (Dk br cf S, s \$, l cf G, w/asphalt)                                                          |        |        |      |                      | Rec = 7"<br>moist<br>auger on boulder<br>moved 4' west<br>Rec = 3"<br>moist |  |
| 2                                                                                |                       |               | 16                           |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               | 41                           |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 3                                                                                |                       | S-2           | 11                           |                 | FILL (same , br l \$)                                                                               |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               | 14                           |                 | <u>FILL (Dark brown coarse to fine SAND, some Silt, little coarse to fine Gravel, with asphalt)</u> |        |        |      |                      | 5'0"                                                                        |  |
| 4                                                                                |                       |               | 17                           |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 5                                                                                |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               | 4                            |                 | <u>Brown coarse to fine SAND, some Silt, some coarse to fine Gravel</u>                             |        |        |      |                      | 6'0"                                                                        |  |
| 6                                                                                |                       | S-3           | 9                            |                 | Br, gr cf G l, cf S, t (+) \$                                                                       |        |        |      |                      | possible old topsoil layer<br>Rec = 16"<br>moist                            |  |
|                                                                                  |                       |               | 23                           |                 |                                                                                                     |        |        |      |                      | Rec = 3"<br>wet<br>very dense drilling                                      |  |
| 7                                                                                |                       |               | 44                           |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       | S-4           | 50/5"                        |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 8                                                                                |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               |                              |                 | <u>Shale, Completely Weathered</u>                                                                  |        |        |      |                      | Rec = 0"                                                                    |  |
| 9                                                                                |                       |               |                              |                 | <u>Brown, gray coarse to fine GRAVEL</u>                                                            |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               |                              |                 | <u>little, coarse to fine Sand, trace (+) Silt</u>                                                  |        |        |      |                      |                                                                             |  |
| 10                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       | S-5           | 50/5"                        | same            |                                                                                                     |        |        |      |                      |                                                                             |  |
| 11                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 12                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 13                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 14                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
|                                                                                  |                       |               |                              |                 |                                                                                                     |        |        |      |                      | 14'6"                                                                       |  |
| 15                                                                               |                       |               |                              |                 | <u>End of Boring @ 14'6"</u>                                                                        |        |        |      |                      | Auger refusal 14'6"<br>bedrock starting @ 6'0"                              |  |
| 16                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 17                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 18                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 19                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 20                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 21                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |
| 22                                                                               |                       |               |                              |                 |                                                                                                     |        |        |      |                      |                                                                             |  |



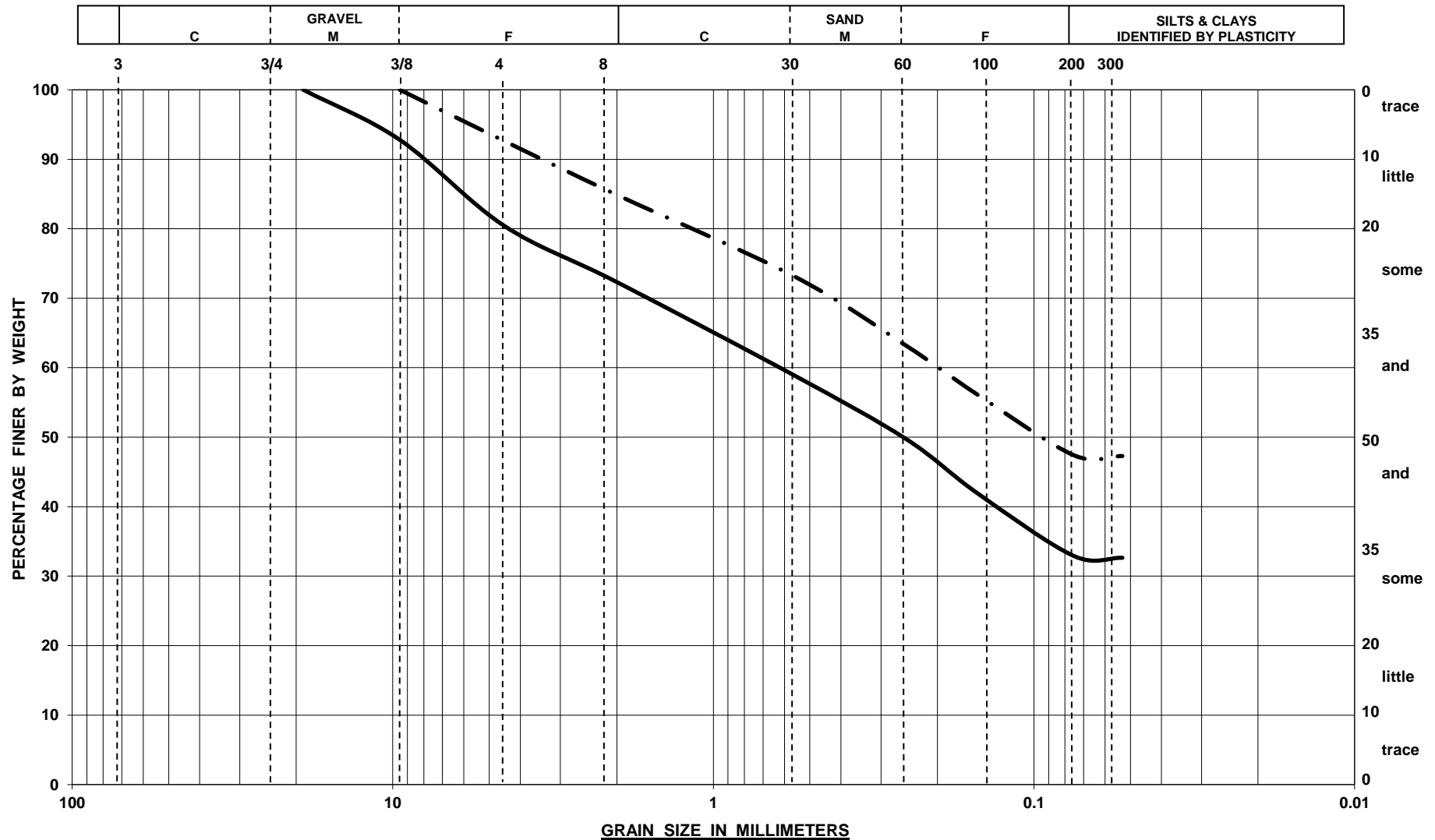
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|----------------------------------------------------------------------------------|-----------------------|---------------|------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|--------|------|------|---------------------------------------------------------|--|
| CARLIN-SIMPSON & ASSOCIATES<br>Sayreville, NJ                                    |                       |               |                              | TEST BORING LOG |                                                                                                                                       |        |      |      | BORING NUMBER<br>B-6                                    |  |
| Project: Proposed Building/New Firehouse, 872 Blooming Grove Tpk, New Windsor NY |                       |               |                              |                 |                                                                                                                                       |        |      |      | SHEET NO.: 1 of 1                                       |  |
| Client: H2M Architects + Engineers                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      | JOB NUMBER: 20-226                                      |  |
| Drilling Contractor: General Borings Inc.                                        |                       |               |                              |                 |                                                                                                                                       |        |      |      | ELEVATION: -                                            |  |
| GROUNDWATER                                                                      |                       |               |                              |                 | CASING                                                                                                                                | SAMPLE | CORE | TUBE | DATUM: -                                                |  |
| DATE                                                                             | TIME                  | DEPTH         | CASING                       | TYPE            | HSA                                                                                                                                   | SS     |      |      | START DATE: 15/Jan/21                                   |  |
| 15/Jan/21                                                                        | 1315                  | 6'0"          | HSA                          | DIA.            | 3 1/4"                                                                                                                                | 1 3/8" |      |      | FINISH DATE: 15/Jan/21                                  |  |
|                                                                                  |                       |               |                              | WGHT            |                                                                                                                                       | 140#   |      |      | DRILLER: T McGovern                                     |  |
|                                                                                  |                       |               |                              | FALL            |                                                                                                                                       | 30"    |      |      | INSPECTOR: JP                                           |  |
| Depth (ft.)                                                                      | Casing Blows per Foot | Sample Number | Blows on Sample Spoon per 6" | S y m           | IDENTIFICATION                                                                                                                        |        |      |      | REMARKS                                                 |  |
| 1                                                                                |                       | S-1           | 2                            |                 | <u>Topsoil</u> 0'8"                                                                                                                   |        |      |      | Rec = 12"<br>moist                                      |  |
|                                                                                  |                       |               | 8                            |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 2                                                                                |                       |               | 12                           |                 | FILL (Br cf S, 1 \$, 1 cf G)                                                                                                          |        |      |      |                                                         |  |
|                                                                                  |                       |               | 9                            |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 3                                                                                |                       | S-2           | 9                            |                 | FILL (same, slightly mttld br, gr, or a (+) \$)<br><u>FILL (Brown coarse to fine SAND, little Silt, little coarse to fine Gravel)</u> |        |      |      | Rec = 19"<br>moist                                      |  |
|                                                                                  |                       |               | 10                           |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               | 12                           |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 4                                                                                |                       |               | 15                           |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 5                                                                                |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 6                                                                                |                       | S-3           | 37                           |                 | FILL (same) 5'11"                                                                                                                     |        |      |      | Rec = 0"<br>Auger chewing 5'-10'<br>very dense drilling |  |
|                                                                                  |                       |               | 50/5"                        |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 7                                                                                |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 8                                                                                |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 9                                                                                |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 10                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 11                                                                               |                       | S-4           | 50/1"                        |                 | Shale, Completely Weathered                                                                                                           |        |      |      | Rec = 0"                                                |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 12                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 13                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 14                                                                               |                       |               |                              |                 | <u>End of Boring @ 13'0"</u>                                                                                                          |        |      |      | Auger refusal 13'0"<br>bedrock likely starting 6'0"     |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 15                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 16                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 17                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 18                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 19                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 20                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 21                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
| 22                                                                               |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |
|                                                                                  |                       |               |                              |                 |                                                                                                                                       |        |      |      |                                                         |  |

SIEVE ANALYSIS



| SYMBOL | BORING | SAMPLE | DEPTH       | DESCRIPTION                                                                                        | NAT MC |
|--------|--------|--------|-------------|----------------------------------------------------------------------------------------------------|--------|
| —      | B-1    | S-3    | 5'0"-7'0"   | FILL(Mtt'd, Brown, gray, orange coarse to fine GRAVEL and (+), coarse to fine Sand, some (+) Silt) | 11.5%  |
| — ·    | B-2    | S-4    | 7'0" - 9'0" | Gray coarse to fine Sand, some (+) Silt, and (-) medium to fine Gravel                             | 13.0%  |

# SIEVE ANALYSIS



| SYMBOL | BORING | SAMPLE | DEPTH       | DESCRIPTION                                                                | NAT MC |
|--------|--------|--------|-------------|----------------------------------------------------------------------------|--------|
| —      | B-4    | S-1    | 0'0" - 2'0" | FILL(Brown coarse to fine Sand, some (+) Silt, some medium to fine Gravel) | 12.3%  |
| - .    | B-6    | S-2    | 2'0" - 4'0" | FILL(Brown coarse to fine Sand, and (+) Silt, little medium to fine Sand)  | 12.8%  |

PROJECT New Firehouse, 872 Blooming Grove Turnpike, New Windsor, New York

BY NJA

DATE 2-Feb-21

JOB NO 20-226

## **APPENDIX B**

### **VAILS GATE FIRE DISTRICT**

**NEW STORAGE BUILDING (Phase 1)  
And  
NEW FIREHOUSE (Phase 2)  
872 BLOOMING GROVE TURNPIKE, NEW YORK 12553**

**PROJECT LABOR AGREEMENT**

**PROJECT LABOR AGREEMENT  
FOR  
CONSTRUCTION RELATED TO THE  
VAILS GATE FIRE DISTRICT  
PHASE I AND PHASE II**

**Town of New Windsor, New York**



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19. SCHEDULE A.

Current Collective Bargaining Agreements – All signatory  
Local unions.



## ARTICLE 1 – PREAMBLE

This Agreement for the Vails Gate Fire District Project entered into this 1<sup>st</sup> day of November, 2021, by and between the Vails Gate Fire District hereinafter ("Owner") and the Hudson Valley Building and Construction Trades Council (herein after "Unions" and "HVBCTC") and affiliated local unions having jurisdiction on the project located at 872 Blooming Grove Turnpike, New Windsor, New York.

WHEREAS this Project Labor Agreement ("Agreement") will foster the achievement of these goals including:

1. Standardizing the terms and conditions governing the employment of labor on the Project.
2. Open communication between the unions, owner and contractors through establishment of Labor Management Committee as referenced in the agreement.
3. Receiving negotiated adjustments as to work rules, wages/benefits and staffing requirements from those which otherwise might not provide the same.
4. Providing comprehensive and standardized mechanisms for the settlement of work disputes, including those related to jurisdiction.
5. Ensuring a reliable source of skilled and experienced local labor.
6. Furthering public policy objectives as to improved employment opportunities for local workers, minorities, women and the economically disadvantaged in the construction industry.
7. Avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes and promote labor harmony and peace for the duration of the Project.
8. Expediting the construction process and otherwise minimizing the public safety and inconvenience caused by ongoing construction; and,
9. Furthering public policy objectives by lawfully expanding work opportunities for minorities and women.
10. Elimination of Wicks Law, allowing for a single prime contractor.

WHEREAS the parties subject to the terms of this Agreement desire the stability, security and work opportunities afforded by a Project Labor Agreement.

Now, therefore, it is agreed as follows:

## **ARTICLE 2 – PARTIES COVERED BY THIS AGREEMENT AND GENERAL CONDITIONS**

### **Section 1. Parties by this Agreement**

The parties covered by and subject to the terms of this Agreement are:

- a. The Hudson Valley Building and Construction Trades Council together with its affiliated Local Unions as identified on signature page.
- b. Contractors and sub-contractors (regardless of tier) who have been awarded contracts pursuant to the bidding procedures applicable to this Project, including Construction Manager if utilized by the Vails Gate Fire District.
- c. Vails Gate Fire District as owner.
- d. All parties shall be required to sign this Agreement.

### **Section 2. Certain Definitions**

- a. Throughout this Agreement, the Hudson Valley Building and Construction Trades Council ("HVBCTC") and its affiliated Local Union members are sometimes referred to singularly and collectively as "Union(s)".
- b. "Schedule A" means those local union collective bargaining agreements of affiliated local unions with jurisdiction on the project.
- c. "Contractor(s)" means contractor(s) who have been awarded contracts for this Project and subcontractors of any tier engaged by Contractor(s) for on-site Project construction work including construction managers.
- d. "Employee(s)" means employee(s) of Contractor(s).

### **Section 3. Supremacy Clause**

This Agreement, together with the local Collective Bargaining Agreements appended hereto and referred to herein as "Schedule A" represents the complete understanding with respect to the Project and supersedes any national agreement, local agreement, or other collective bargaining agreement of any type which would otherwise apply to Project Work, in whole or in part, with the following exception: to the extent a Contractor is a signatory to the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, the UA/BEW Joint National Agreement for Instrument and Control Systems Technicians, and the National Agreement of the International Union of Elevator Constructors, those agreements shall apply. Notwithstanding this exception, Articles 7.9 and 10 of this Agreement shall apply. Where a subject covered by the provisions of this Agreement is also covered by a Schedule A, the provisions of this Agreement shall prevail. If this Agreement is silent on any matter addressed in the applicable Schedule A agreement, the Schedule A agreement shall govern.

#### **Section 4. Liability**

The liability of any Contractor and/or any Union under this Agreement shall be several and not joint. The Owner and any Contractor shall not be liable for any violations of this Agreement by any other Contractor.

#### **Section 5. Bid Specifications**

- a. The bid specifications of the Project will require that all successful bidders, contractors, construction managers and subcontractors of whatever tier are bound by this Agreement. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of Owner in determining which bidder(s) shall be awarded contracts for the Project. It is further understood that Owner has sole discretion at any time to terminate, delay or suspend the Project, in whole or part. All Contractors will be required to sign a Letter of Assent acknowledging this Agreement and to allow purchase of benefits.

### **ARTICLE 3 – SCOPE OF THIS AGREEMENT**

This agreement shall be as defined and limited by the following sections of this Article 3.

#### **Section 1. The Work**

This Agreement applies only to all construction work on the owned or leased properties of the owner located at 872 Blooming Grove Turnpike, New Windsor, New York which includes but not limited to demolition, site work and new construction of 2 buildings. The construction work is a two phase project which will be bid separately.

#### **Section 2. Term**

This Agreement commences November 1, 2021 and shall remain in effect for the duration of the Project(s) on this site.

#### **Section 3. Excluded Persons**

The following persons are not subject to the provisions of the Agreement, even though performing non-construction work on the Project site:

- a. Project Managers, Superintendents, supervisors (excluding general and forepersons specifically covered in Schedule A) engineers, inspectors and testers, quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, deliverers, suppliers, messengers, non-manual employees, and all professional, engineering, administrative and management persons.
- b. Employees of the owner; not performing construction
- c. Persons engaged in laboratory or specialty testing or inspections not ordinarily done by a member of a Trade Union (excludes surveyors).

- d. Employees and entities engaged in off-site manufacture not covered by Schedule A agreement, modifications, repair, maintenance, assembly, painting, handling or fabrication of components, materials, equipment or machinery or involved in deliveries to and from the Project site, except for local deliveries of fill, ready mix, asphalt and granular materials which is covered under this agreement.
- e. Employees of the Contractor, other contractors or subcontractors of any tier excepting those performing manual, on-site construction labor who will be covered by this Agreement and Schedule A.
- f. Deliveries to the site with the exception of items specifically called out in Article 3, Section d.
- g. Employees engaged in on-site equipment maintenance/warrant work or start up work typically not performed by trades or when required for warranty or training purposes. When a Contractor has an employee already certified by the relevant manufacturer to make warranty repairs on that Contractor's equipment, that employee shall be used.
- h. Employees engaged in geophysical testing (whether land or water) other than boring for core samples.

## **ARTICLE 4 – REFERRAL AND EMPLOYMENT**

### **Section 1. Referral**

- a. Contractors agree to hire craft employees covered by this Agreement through the job referral systems and/or hiring halls (where the referrals meet the qualifications set forth in items 1. 2. 3 and 4 of subparagraph (b) established in the Local Unions' area Collective Bargaining Agreement or other sources so long as the Contractors do not unlawfully discriminate between prospective employees in violation of existing laws on the basis of Union affiliation, race, religion or gender.
- b. The Local Unions shall exert their utmost efforts to recruit sufficient numbers of skilled craft workers to fill the manpower requirements of the Contractor. The parties to this Agreement support the development of increased numbers of skilled construction workers from Orange County and its immediate vicinity to meet the needs of this Project and the requirements of the industry generally.

### **Section 2. Non-Discrimination in Referrals**

The local Unions represent that their hiring halls and/or referral systems will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership or lack thereof. Local unions agree to adhere to local labor policies if applicable to the project.

### **Section 3. Tag Along**

a. No more than 12 ½ per centum (12 ½ %) of the employees covered by this Agreement per Contractor by craft, shall be hired through the special provisions below (any fraction shall be rounded to the next highest whole number). Contractors (and their subcontractors) shall be entitled to assign to the Project (subject to the above provisions) one of the Contractor's "core" employees, and then must hire one journey person referred by the Local on the same day as "core" employee and 12 ½ % thereafter.

The local unions referral of persons who have applied to the Local for Project work or are currently employed by contractor performing work meet the following qualifications as determined by a Committee of three (3), designated respectively, by the Contractor, the applicable local union and a third party mutually agreed upon by the Building Trade Council and Construction Manager.

1. Possess any license required by NYS law for the Project work to be performed.
2. Have worked a total of at least 1000 hours in the construction craft during the prior 2 years.
3. Were on Contractor's active payroll for at least 60 out of 180 calendar days prior to the start of project work.
4. Have demonstrated ability to safely perform the basic functions of the applicable trade.

b. In the event the Local Union is unable to fill any request for qualified employees two working days after such request is made by the CONTRACTOR, the CONTRACTOR may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the CONTRACTOR shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The CONTRACTOR shall notify the Local Union of Project, craft employees hired within its jurisdiction from any source other than referral by the Union.

### **Section 4. Union Dues/Fringe Benefits**

- a. Nothing in this Agreement requires employees to join a union or pay dues or fees to a union as a condition of working on the covered project. This Agreement is not, however, intended to supersede independent requirements in applicable local union agreements as to contractors that are otherwise signatory to those agreement and as to employees of such employers performing covered work.
- b. In addition, each Contractor agrees to pay contributions to established and jointly trusted fringe benefit funds (the Funds), such as but not limited to Health and Welfare, Pension, Annuity, Legal Service, Education and Training, SUB, Apprenticeship, etc. in the amounts designated in the applicable collective bargaining agreement for. The Contractors agreed to be bound by the written terms of the legally established and jointly trusted Funds specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Funds but only with regard to project work and only for those employees for whom this Agreement requires such benefit payments. No union, or any union benefit fund trustees, or any other individual affiliated with the union or a Fund shall have any authority under this Agreement or otherwise to audit the financial records of the Construction Manager or any Contractor that is not

signatory to an existing collective bargaining agreement with the union except for the records related to compliance with contribution obligations set forth in the Agreement.

- c. However, with respect to any Contractor's employees not referred by the unions, a Contractor may, at its option, satisfy the above fringe benefit obligations by providing such employees with coverage under the Contractor's private benefit plan(s) or benefit plans under a collective bargaining agreement with a union not signatory to this Agreement (to the extent consistent with Section 220 of the NYS Labor Law) or electing to pay into the applicable jointly trusted Funds designated in the appropriate Schedule A collective bargaining agreement on their behalf.
- d.
  - 1. To insure the full and timely remittance of required fringe benefit contributions to the Funds and dues to the unions, the Construction Manager will work cooperatively with the Funds (or unions, in the case of dues) to verify that the required fringe benefit contributions or dues have been paid.
  - 2. If a Fund (or Union in the case of dues) considers that a Contractor is delinquent in the payment of fringe benefit contributions or dues, it will notify the Contractor in writing with a copy to the Construction Manager. The Contractor will have thirty (30) days to make the contributions requested by the Fund or dues, if requested by a union. If after 30 days, the Fund or Union is not satisfied that the Contractor has met its obligations, the Fund or Union will provide written notification to the Construction Manager and the Contractor at issue (given by certified mail, return receipt requested or email that a Contractor is delinquent in payment of fringe benefit contributions or dues.
  - 3. The Contractor will have fifteen (15) days from its receipt of the Union's notification to respond to the Union's notification or has not satisfied its obligation to the union. If the Contractor fails to respond to the Union's notification of delinquency, the Construction Manager will withhold from sums due to the Contractor the amount of such delinquencies and issue a joint check in the delinquent amount of sums due to the Contractor, and the Construction Manager and the Contractor will make all future payments to the Contractor by joint check to the appropriate fund (or Union, in the case of dues) and the Contractor up to the amount of the claimed delinquency. If the Construction Manager fails to withhold or there are no funds due to the Contractor which the Construction Manager can withhold, the Union involved may stop work for that specific Contractor. Nothing herein shall result in the Construction Manager being liable and/or responsible for payment of delinquent fringe benefit contributions or dues.
  - 4. If the Fund or Union disagrees with the Contractor's response and continues to believe that there are delinquencies, it will notify the Contractor in writing of such conclusion within fifteen (15) days after receiving the Contractor's response. The Union or Fund upon giving actual backup will provide a copy of such notification to the Construction Manager who will withhold from money owed to the Contractor an amount equal to the claimed delinquencies and any percent of those delinquencies as may be allowed under the applicable collective bargaining agreement. The Fund or Union may also require the Construction Manager to make all future payments to the Contractor by joint check to the appropriate Fund (or Union, in the case of dues) and the Contractor up to the amount of the claimed delinquency. The Contractor hereby consents to payments to be made by such joint check to the Fund (or Union, in the case of dues) until all payments of contributions or dues are current and the Fund (or Union, in the case of dues) notifies the Construction Manager of such in writing by certified mail, return receipt requested.

5. If the Contractor and the Fund (or Union, in the case of dues) are unable to resolve any claims for alleged delinquent contributions or dues, the Contractor will have the right to arbitrate the matter pursuant to this Agreement. If the Fund or Union prevails in such arbitration the Construction Manager will pay the delinquencies up to the amount it has withheld. If the Contractor prevails in such arbitration, the Construction Manager will then release any withholdings to the Contractor if the Contractor has otherwise qualified for payment of such withholdings.

6. The Labor Management Alliance Fund established by the Council may become part of this agreement if allowable by law.

7. The Construction Manager contact in reference to benefit delinquencies shall be:

NAME: \_\_\_\_\_ (TBD)

PHONE: \_\_\_\_\_

EMAIL: \_\_\_\_\_

## **Section 5. Craft Forepersons and General Forepersons**

The selection of craft forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Collective Bargaining Agreement, Schedule A. All forepersons shall take orders exclusively from the designated contractor representatives. Craft forepersons shall be designated as working forepersons at the request of the Contractor.

## **ARTICLE 5 – UNION REPRESENTATION**

### **Section 1. Local Union Representative**

Each Local Union representing on-site Project employees shall be entitled to designate representatives in writing to the Construction Manager who shall be afforded access to the Project. Union Representatives will not be able to interfere with the work and shall comply with visitor rules if required included but not limited to all safety protocols, PPE and required COVID process as required.

### **Section 2. Stewards**

- a. Each Local Union may have the right to designate a working journey person as a steward and shall notify the Contractor of the identity of the designated Steward prior to the assumption of such duties. Stewards shall not exercise supervisory functions, adhere to all safety, jobsite and Covid rules and regulations. Stewards must perform the actual work of their trade. There will be no non-working Stewards on the Project.
- b. In addition to their work as an employee of their specific trade, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Stewards Contractor and, if applicable, subcontractors of that Contractor. The Contractor will not discriminate against the Steward in the proper performance of Union duties.

- c. The Stewards shall not have the right to determine when overtime shall be worked and who shall work overtime.
- d. The General Contractor/Prime Contractor shall employ the Labor Steward. This may be satisfied by making arrangements with another contractor to provide such employment during site work and demolition if general contractor does not have full time work for the Steward. The above referenced employer shall not be required to carry the Steward's if there is no work of that particular trade.
- e. Where Steward is used in Article 5, the same shall apply to Lead Engineer if a Lead Engineer is required by the Local 825 Collective Bargaining Agreement (Schedule A). Lead engineer shall be a working lead engineer.

### **Section 3. Layoff of a Steward**

Contractors agree to notify the appropriate Local Union twenty-four (24) hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Collective Bargaining Agreement, such provisions shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

## **ARTICLE 6 – MANAGEMENT'S RIGHTS**

### **Section 1. Reservation of Rights**

Except as expressly limited by a specific provisions of this Agreement, Contractors retain full and exclusive authority for the management of their operations including, but not limited to: the right to direct the work force; including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, or the discipline or discharge for a just cause of its employees; the assignment and schedule of work; the promulgation of reasonable Project work rules, and the requirement, timing and number of employees to be utilized for overtime work. Nothing contained herein shall be construed so as to allow direction of an Employee to perform work outside the jurisdiction of that Employees Labor Union affiliation, if any. No rules, customs, or practices as determined by the contractor which limit or restrict productivity or efficiency of the individual, and/or joint working efforts with other employees shall be permitted or observed.

### **Section 2. Materials, Methods & Equipment**

There shall be no limitation or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, prefabricated, pre-finished (except that all rebar for use in the cast-in place, on-site construction will be cut and bent in accordance with local industry practices), or pre-assembled materials, tools or other labor-saving devises. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such work pursuant to Collective Bargaining Agreement; provided, however, it is recognized that other personnel having



special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor. There shall be no restrictions as to work which is not performed at the Project site, unless specifically spelled out in Schedule A.

## **ARTICLE 7 – WORK STOPPAGE AND LOCKOUTS**

### **Section 1. No Strikes, No Lock Out**

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdown, hand billing, demonstrations or other disruptive activity at the Project site for any reason by any Local Union or Employee against any Contractor or Employer while performing work at the Project site, except for non-payment of wages and benefits as per Schedule A. There shall be no other Local Union or concerted Employee activity which disrupts or interferes with the operation of the Project. Failure of any Local Union or employee to cross any picket line established by any union signatory or non-signatory to this Agreement or the picket or demonstration line of any other organization, at or in proximity to the Project site is a violation of this Article 7. There shall be no lockout at the Project by Owner or any Contractor. Contractors and Local Unions shall take all steps necessary to ensure compliance with this Section 1.

### **Section 2. Discharge for Violation**

A Contractor may discharge any Employee violating Section 1 above and any such Employee will not be eligible thereafter for referral under this Agreement for a period of one hundred (100) days.

### **Section 3. Notification**

If a Contractor contends that any party covered by this Agreement has violated this Article 7, it will notify the CM and/or the Local Union involved advising of such fact with copy to the BCTC and to the Local Union. The BCTC shall instruct, order or otherwise use its best efforts to cause the Employees, Contractors and/or the Local Unions to immediately cease and desist from any violation of this Article 7. The BCTC complying with these obligations shall not be liable for the unauthorized acts of a Local Union or its members.

### **Section 4. Expedited Arbitration**

Any party alleging a violation of Section 1 of this Article 7 may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity). Shall be mutually agreed upon between the Construction Manager and the Union.

- a. A party invoking this procedure shall notify The American Arbitration Association Arbitrator who shall act as Arbitrator Service under this expedited arbitration procedure. Copies of such notification will be simultaneously sent to the alleged violator, the CM or General Contractor and if a Local Union is alleged to be in violation, then to the HVBCTC.
- b. The Arbitrator shall thereupon, after notice to all parties covered as to time and place, hold a hearing within seventy-two (72) hours of receipt of the notice invoking the procedures if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than seventy-two (72) hours after the notice to the BCTC required by Section 3, above.

- c. All notices pursuant to this Article 7, must be in writing to the parties involved. The hearing may be held on any day except Saturdays and Sundays. The hearing shall be completed in one session, which shall not exceed Eight (8) hours duration with no more than Four (4) hours being allowed to either side to present its case and conduct its cross examination unless otherwise agreed. A failure of any party to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.
- d. The sole issue at the hearing shall be whether a violation of Section I above has occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease-and-Desist Order restraining such violation and serve copies on the party determined to be in violation. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved solely for other proceedings, if any. The decision shall be issued in writing within three (3) hours after the close of the hearing and may be issued without an opinion. If any involved party desires an opinion, one shall be issued within fifteen (15) calendar days, but its issuance shall not delay compliance with, or enforcement of, the decision.

A decision issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the decision. Notice of the filing of such enforcement proceedings shall be given to the party involved. In any court proceeding to obtain a temporary or preliminary order enforcing the arbitrator's

Award as issued under this expedited procedure, the involved Party and Contractor waive their right to a hearing and agree that such proceedings may be exparte, provided notice is given to opposing counsel. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

- e. Any rights created by statute or law governing arbitration proceedings which are inconsistent with this procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.
- f. The fees and expenses of the Arbitrator shall be paid by the losing party.

## **Section 5. Arbitration of Discharges for Violation**

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an Employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the Employee did, in fact, violate the provisions of Section 1 of this article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

## **ARTICLE 8 – LABOR MANAGEMENT COMMITTEE**

**Section 1.** The parties bound by this Agreement shall establish a local Labor Management Committee (LMC) to promote harmonious labor-management relations, ensure adequate communications and advance the proficiency of craft employees and the industry. This committee shall be chaired by the Labor Relations Coordinator which shall be mutually agreed upon by the unions and construction manager or general contractor, the LMC and will meet at periodically scheduled intervals for a discussion of the efficiency of the

Project as is consistent with this Agreement and any amendments or addenda thereto. Participation shall be encouraged from all incumbent Employers and Unions signatory to this Agreement. The Labor Relations Coordinator shall administer and coordinate the implementation of this Agreement, chair the LMC, develop policies and procedures of operation, and publish meeting agenda and issue minutes of each LMC meeting.

**Section 2.** The LMC will make every effort possible to anticipate jurisdictional conflicts or other potential and disruptive labor issues and take appropriate measure to minimize any adverse impact to the Project.

**Section 3.** The principal Union(s) and Labor Relations Coordinator (negotiators for this Agreement) shall rule on any Agreement interpretations or clarifications, which may be required. Such rulings or clarifications, as may be required, shall be reduced to writing, jointly signed by the LMC, distributed to the signatory parties and reviewed at the next LMC meeting. The Labor Relations Coordinator reserves the exclusive right to interpret this Agreement for all signatory Employers, program manager, construction managers, and subcontractors (at any tier). Such “reserved right” shall not apply to interpretations of this Agreement on behalf of the Unions.

**Section 4.** The functions, decisions, rulings and any directives that may be promulgated by the Labor Relations Coordinator, or LMC under this Agreement are exclusive to this Project(s) and shall not apply to other area projects.

**Section 5.** The Committee shall include the Labor Relation Coordinator, President of Council, 1 Officer from Council, a representative from the Construction Manager and a representative from the Owner.

## **ARTICLE 9 – GRIEVANCE & ARBITRATION PROCEDURE**

### **Section 1. Procedure for Resolution of Grievances**

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violation of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedures of the steps described below; provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

**Step 1:**

- a. When any party covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the party shall, through the Local Union business representative, job steward or Contractor give notice of the claimed violation to the work site representative of the involved Contractor. To be timely, such notice of the grievance must be given within fourteen (14) calendar days after the act, occurrences or event giving rise to the grievance. The business representative of the Local Union, the job steward, the Party and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within forty-eight (48) hours after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party may, within fourteen (14) calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor and the CM or its assignee with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, non-affiliated Party Employee and contractor directly involved unless the settlement is accepted in writing by Owner, or its designated representative as creating a precedent.
- b. Should any party to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other party to this Agreement and, if after conferring, a settlement is not reached within fourteen (14) calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) above for the adjustment of Employee grievances.

**Step 2:**

The Business Manager or designee of the involved party, together with the representatives of BCTC, the involved Contractor, and Owner, or its designated representative shall meet within seven (7) calendar days of service of the written grievance arrive at a satisfactory settlement.

**Step 3:**

- a. If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within twenty-one (21) calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants) to J.J. Pierson or Richard Adelman Arbitrators under this procedure or such other arbitrators agreed to by the parties herein. The Labor Arbitration Rules of the American

Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the arbitrator shall be final and binding on the involved Contractor, local union and employees. The fees and expenses of such arbitrations shall be paid by the losing party. Named Arbitrators shall be alternate beginning with J.J. Pierson or such other arbitrator agreed to by the parties herein.

- b. Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the parties at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him

and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

## **Section 2. Limitation as to Retroactivity**

No arbitration decision or award may provide retroactivity of any kind exceeding Sixty (60) calendar days prior to the date of service of the written grievance on the involved Contractor or Local Union.

## **Section 3. Participation by Owner or its Designated Representative**

Construction Manager shall be notified by the involved parties of all actions at Steps 2 and 3 and, at its election, may participate in full in all proceedings at these steps, including Step 3 arbitration.

# **ARTICLE 10 – JURISDICTIONAL DISPUTES**

## **Section 1. No Disruptions**

- a. There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted. No jurisdictional dispute shall excuse a violation of Article 7.
- b. No jurisdiction dispute shall affect coordination of the various contractors at the Project or the progress of the Project.
- c. The Signatories to this agreement adhere to the principle that jurisdictional disputes cannot and shall not interfere with the project.
- d. Every effort will be made by the Employer to resolve all anticipated disputes over work assignments. These efforts will include pre-job conferences, jurisdictional mark-up meetings and similar such conferences. Pre-job conferences must be held by each Employer prior to the field work actually starting. The Construction Manager is recognized as a party of interest in the resolution of any and all jurisdictional disputes and their Labor Relations Manager will be notified of all meetings and may attend and participate. Resolution of jurisdictional disputes will not include any "over manning" or the requirement to assign employees to any work functions other than the number that may be required to safely execute the work. No back pay or any other monetary penalty shall be assessed against any Employer in the resolution of jurisdictional disputes.

## **Section 2. Assignment**

The assignment of work will be solely the responsibility of the Contractor performing the work involved; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") and where there are Memorandums or Agreements in place between the unions they shall apply without dispute.

### **Section 3. Procedure for Settlement of Disputes**

- a. Any Union having a jurisdictional dispute with respect to Project work assigned to another Union will submit the dispute in writing to the Administrator, Plan for the settlement of Jurisdictional Disputes in the Construction Industry within seventy-two (72) hours and send a copy of the letter to the other Contractor involved, and the Local Union involved. Upon receipt of a dispute letter from any Local Union, the Administrator will invoke the procedures set forth in the Plan to resolve the jurisdictional dispute. The jurisdictional dispute letter shall contain the information described in Article IV of the Plan.
- b. Any Contractor involved in a jurisdictional dispute on this Project shall continue working and without disruption of any kind.

### **Section 4. Limitations**

The Jurisdictional Dispute Arbitrator shall have no authority to assign work to a double crew, that is, to more employees than the minimum required by the Contractor to perform the work involved; nor to assign the work to employees who are not qualified to perform the work. This does not prohibit the establishment, with the Agreement of the involved Contractor, of composite crews where more than one employee is needed for the job. The aforesaid determinations shall decide only to whom the disputed work belongs.

### **Section 5. No Interference with Work**

There shall be no interference or interruption of any kind with the work of the Project while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award.

## **ARTICLE 11 – HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS & HOLIDAYS**

### **Section 1. Work Week and Work Day**

- a. The standard work week shall consist of forty (40) hours or work at straight time rates either a five (5) day work week Monday – Friday; eight (8) Hours per day, plus one half (1/2) hour unpaid lunch period each day, or a four (4) day work week Monday – Thursday; ten (10) hours per day, plus one half (1/2) hour unpaid lunch period each day. When on a 4-day 10 hour per day work week, Friday shall be used as a makeup and when 5-day 8 hour per day work week, Saturday shall be used as a make-up day to fulfill the forty (40) hour work week. Make up days shall be worked a minimal four (4) hours when on 5 (8's) or five (5) hours when on 4 (10's). No employee shall be disciplined for refusing to work the Saturday make up day.
- b. The Day Shift shall commence between the hours of 6:00 a.m. and 4:30 p.m. Starting and quitting times shall occur at the staging areas designated by the Contractor. Other shifts shall similarly commence and end at uniform times agreed upon by the Contractor and Union. Sub-contractor starting times maybe different then the

established starting time of the general contractor or construction manager but start no earlier than 6:00 am or later than 8:00 am.

- c. Notice – Contractors shall provide not less than seven (7) days prior notice to the Unions as to the workweek and work hour schedules to be worked or such lesser notice as may be mutually agreed upon.

## **Section 2. Overtime**

Overtime pay for hours outside of the standard work week and workday, described in Section 1, paragraph (a) above, shall be paid at time and a half, Saturdays shall be at time and a half and Sundays shall be at double time unless Schedule A requirement is less. There will be no restriction upon the Contractor's scheduling or overtime or the non-discriminatory designation of employees who shall be worked. The Contractor shall have the right to schedule work so as to minimize overtime.

## **Section 3. Starting Times and Shifts**

- a. There shall be a uniform start time for all Contractors and employees or each shift in accordance with Section 1 above.
- b. Flexible Schedules – To the extent that they do not have a cost impact on the Project, scheduling of shift work may remain flexible in order to meet Project schedules and existing Project conditions. Shifts must be worked with a minimum of five (5) consecutive workdays and must be scheduled with the involved unions with not less than three (3) workdays notice to the party. Regularly scheduled shifts will not be paid at overtime rate, but rather at a fixed percentage increase of fifty percent (50%) of the Schedule A shift differentials. For example: when Schedule A shift work is 20%, a 10% shift premium shall apply.
- c. Flexible Starting Times – Shift starting times will be adjusted by the Contractor as necessary to fulfill Project requirements subject to the notice requirements of paragraph (b).
- d. Shift work may be scheduled on either a five (5) day (5-8 hrs.) or four (4) day (4-10 hrs.) work week basis.

## **Section 4. Holidays**

- a. Schedule – There shall be eight recognized holidays on the Project:

|                |                  |
|----------------|------------------|
| New Year's Day | Labor Day        |
| Presidents Day | Veteran's Day    |
| Memorial Day   | Thanksgiving Day |
| Fourth of July | Christmas Day    |

All holidays shall be observed on the dates designated by Law. In the absence of such designation, they shall be observed on the calendar date except those holidays which occur on Saturday shall be observed on Friday and those holidays which occur on Sunday shall be observed on the following Monday.

- b. Payment – Regular holiday pay, if any, and/or premium pay for the work performed on such a recognized holiday shall be in accordance with the applicable Collective Bargaining Agreement. (Schedule A) but not to exceed double pay or straight time benefits regardless of Schedule A.
- c. Exclusivity – No holidays other than those listed in Section 4 – (a) above shall be recognized or observed.

#### **Section 5. Reporting Pay**

- a. Employees who report to the work location pursuant to regular schedule and who are not provided with work or whose work is terminated early by a Contractor, for whatever reason shall receive two (2) hours pay and benefits if not provided work or no work has started, four (4) hours pay and benefits if work starts and paid for actual hours worked including benefits for hours thereafter the fourth hour when on a five (5) day, eight (8) hour work week. When on a four (4) day, ten (10) hour per day work week, two and a half (2 ½), five (5) and actual hours worked after five (5) shall apply.
- b. When an employee who has completed a schedule shift and left the Project site is “called-out” to perform special work of a casual, incidental or irregular nature, the Employee shall receive pay for actual hours worked with a minimum guarantee as may be required by the applicable Collective Bargaining Agreement. (Schedule A).
- c. When an employee leaves the job or work location of his own volition or is discharged for cause or is not working as a result of the Contractor’s invocation of Section 7 below, he shall be paid only for the actual time worked.
- d. There shall be no pay for time not actually worked except as specifically set forth in this Article or as specifically provided in a Schedule A.

#### **Section 6. Payment Wages**

- a. Payday – Payment shall be made by check, drawn on a New York bank with branches located within commuting distance of the job site. Paychecks shall be issued by the Contractor at the job site by 10 a.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than three days wages shall be held back in any period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.
- b. Termination – Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of lay off or discharge.



- c. Wages and Benefits shall be paid as per applicable schedule A unless modified in this agreement.

### **Section 7. Emergency Work Suspension**

A Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of Project work. In such instances, employees will be paid for actual time worked; provided, however, that when a Contractor requests that employees remain at the job site available for work, employees will be paid for "stand-by" time at their hourly rate of pay, by the applicable Schedule A.

### **Section 8. Injury/Disability**

An employee, who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than eight (8) Hours wages for that day. Further, the employee shall be rehired at such time as said employee is able to return to duties provided there is still work available on the Project for which the employee is qualified and able to perform.

### **Section 9. Time Keeping**

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

### **Section 10. Meal Period**

Employees shall have meal period of not more than one half (1/2) hour duration at the work location between the third and fifth hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more crafts. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule A.

### **Section 11. Break Periods**

There will be one (1) ten (10) minute coffee break two (2) hours after the commencement of the workday. Afternoon break shall be as Schedule A. Lunch break shall be for (30) thirty minutes commencing approximately (4) hours after the start of the established workday. Coffee may be consumed at the employee's place of work as time permits.

## **ARTICLE 12 – APPRENTICES**

### **Section 1. Ratios**

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices in a ratio not to exceed 25% of his work force by craft unless higher apprentice ratio is set forth in Schedule A in which it shall apply.

### **Section 2. Department of Labor**

To assist the Contractors in attaining a maximum effort on this Project, the parties agree to work in close cooperation with, and accept monitoring by the New York State Department of Labor to ensure that minorities and women from the Town of Newburgh and vicinity are afforded every opportunity to participate in apprenticeship programs which result in the placement of apprentices on this Project. The Local unions will cooperate with Contractor requests for minority, women or economically disadvantaged referrals to meet this Contractor effort and/or as provided in the Collective Bargaining Agreement. Effort shall be made to employ pre apprentices who are in a council affiliated program.

## **ARTICLE 13 – SAFETY AND PROTECTION OF PERSON AND PROPERTY**

### **Section 1. Safety Requirements**

Each Contractor will ensure that applicable OSHA requirements are at all times maintained on the Project. Employees of the Contractors must perform their work at all times in a safe manner and protect themselves and the property of the Contractor and Owner from injury or harm. Failure to do so will be grounds for discipline, including discharge.

### **Section 2. Inspections**

Owner retains the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

## **ARTICLE 14 – Miscellaneous Provisions**

### **Section 1. Project Rules**

The Construction Manager or General Contractor shall establish such reasonable Project rules as are appropriate for the good order of the Project. These rules will be explained at the pre-job conference and posted at the Project site and may be amended thereafter as necessary. Failure of an employee of a Contractor to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause. Unless our project work rules violate the CBA or applicable law, the Owner, General Contractor or both shall have sole discretion over establishing rules onsite.

## **Section 2. Tools of the Trade**

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or equipment for the performance of work within the employee's jurisdiction.

## **Section 3. Supervision**

Employees shall work under the supervision of the craft foreperson or general foreperson.

## **Section 4. Travel Allowance**

There shall be no payment for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

## **Section 5. Full Workday**

- a. Employees shall be at their staging area at the time established by the Contractor and shall be returned to their staging area by quitting time after performing their assigned functions under the supervision of the Contractor. The parties reaffirm their policy of a fair day's work for a fair day's wage.
- b. There shall be no non-working employees at the Project (e.g., employees whose only work consists of watching equipment, etc.,).

## **Section 6. Cooperation**

The parties will cooperate in seeking any New York State Department of Labor approvals that may be required for implementation of any terms of this Agreement.

## **Section 7. Veterans**

The employees and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Unions and the County and the Contractors agree to coordinate and maintain an integrated list of veterans from the County interested in working on the Project through the "Helmets to Hardhats" program and, to the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

# **ARTICLE 15 – FUTURE CHANGES IN COLLECTIVE BARGAINING AGREEMENT**

## **Section 1. Changes**

- a. Schedule A to this Agreement shall continue in full force and effect until the applicable Contractor and/or Union parties to the Schedule A CBAs notifies the Construction Manager/General Manager in writing of the mutually agreed upon changes in provisions of such Agreements which are applicable to the Project, and their effective dates.

- b. It is agreed that any work rule provisions negotiated into future Collective Bargaining Agreements will not apply to work on this Project if such provisions are less favorable to this Project than those contained in the expiring Collective Bargaining Agreements as they pertain to work rules; nor shall any provision be recognized or apply on this Project if it may be construed to apply exclusively, or predominantly, to work covered by this Agreement.
- c. Any disagreement over the incorporation into Collective Bargaining Agreements of provisions agreed upon in the re-negotiation of Area Collective Bargaining Agreement shall be resolved in accordance with the procedure set forth in this Agreement.

## **Section 2. Labor Disputes During Negotiation of Collective Bargaining Agreements**

The parties agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdown or other disruptive activity or other violations of this Agreement affecting the Project by any parties involved in the re-negotiation of Collective Bargaining Agreements nor shall there be any lockout on this Project affecting any party during the course of such re-negotiations.

## **ARTICLE 16 – SAVINGS AND SEPARABILITY**

### **Section 1. This Agreement**

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of any law, the provision involved shall be rendered, temporarily or permanently, null and void but the remainder of this Agreement shall remain in full force and effect. In such event, this Agreement shall remain in effect for contracts already bid, awarded or in construction. The parties will enter into negotiations for a substitute provision in conformity with the law and the intent of the parties for contracts to be awarded in the future.

### **Section 2. The Bid Specifications**

In the event that Owner's bid specifications, or other action, requiring that a successful bidder be bound by this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, such requirement shall be rendered, temporarily or permanently, null and void but this Agreement shall remain in full force and effect to the extent allowed by law. In such event, the Agreement shall remain in effect for contracts already bid, awarded or in construction. The parties will enter into negotiations as to modifications to the Agreement to reflect the court action taken and in the intent of the parties for contracts to be awarded in the future.

### **Section 3. Non – Liability**

In the event of an occurrence referenced in Section 1 or Section 2 of this Article 16, neither Owner nor any Contractor nor any Local Union shall be liable, directly or indirectly, for any action taken, or not taken, to comply with any court order, injunction or determination. Project bid specifications will be issued in conformance with court orders then in effect and

no retroactive payments or other action will be required if the original court determination is ultimately reversed.

## **ARTICLE 17 – PROJECT SPECIFIC**

### **Section 1. Workers Compensations ADR**

At the written option of the CM or Owner and with the written approval of the Hudson Valley Building and Construction Trades Council, all Local Unions, Contractors (including sub-contractors) working on this project agree to be bound by the Collectively Bargained Workers Compensation Alternative Dispute Resolution (ADR Agreement) and to the ADR program set forth therein, by and between the Construction Industry Council of Westchester and the Hudson Valley, Inc. and the Building and Construction Trades Council of Westchester and Putnam County, New York in which the "Council" is approved to participate in as amended.

### **Section 2. Cleanup/Housekeeping**

All cleanup during construction shall be performed by the trade having jurisdiction for cleanup. The general contractor is responsible for overall cleanup on the Project, the Owner will ensure a clean and safe workplace. The Owner or General Contractor may back charge contractors accordingly if clean up becomes unsatisfactory.

Once construction is complete and a building, section or floor is turned over for final cleaning to a professional cleaning company for final cleaning including windows and floor prep, up to 33% of the employees may be a direct employee of the cleaning company. Those direct employees shall be exempt from this Agreement.

### **Section 3. FFE**

Work related to furniture, fixtures and equipment that is free standing and requires no onsite assembly and is not fastened, mounted or anchored to any surface by glue, screws, nails, mechanical fastener or by other means in throughout the project is excluded. Accordingly, for the avoidance of doubt, all unloading, handling, assembly, installation and cleanup of all furniture, fixtures and equipment which requires fastening with but not limited to nails, screws, nuts, bolts, staples, anchors, wire or adhesive or requires any on site or designated off site assembly shall be included work under this agreement.

### **Section 5. Construction Manager**

Throughout this agreement where the term Construction Manager is used and there is no Construction Manager used it shall refer to the General Contractor. Owner reserves the right to retain a Construction Manager at any time during either Phase I or Phase II of the Project. In such case, the parties will be notified accordingly.

### **Section 6. Schedule A – CBA's**

Throughout this agreement the term Schedule A refers to the collective bargaining agreements as those local unions having jurisdiction on the project and signatory to this agreement.

**Schedule A – CBA's**

- A. Schedule A Collective Bargaining Agreement can be viewed by visiting the Hudson Valley Building and Construction Trades Council website: [builditunion.org](http://builditunion.org)  
Username: hudsonvalley  
Password: buildingtrades
- B. It shall be the responsibility of the contractor to verify Schedule A Agreements with the respective unions signatory to this Project Labor Agreement.
- C. For questions about this Agreement or Schedule A contact:  
Todd Diorio (845) 565-2737 or email [tdiorio555@aol.com](mailto:tdiorio555@aol.com)  
President, Hudson Valley Building and Construction Trades Council

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective this 1st day of November, 2021.

For: General Contractor

By: \_\_\_\_\_  
NAME/TITLE

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

For: Hudson Valley Building and Construction Trades Council

By: L. Topp Dione - Pres  
NAME/TITLE

R. Topp  
SIGNATURE

11/9/2021  
DATE

For: Vails Gate Fire District

By: \_\_\_\_\_  
NAME/TITLE

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

For: Construction Manager (if applicable)

By: \_\_\_\_\_  
NAME/TITLE

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

FOR THE LOCAL UNIONS:

INTERNATIONAL BROTHERHOOD OF BOILERMAKERS, IRONSHIP BUILDERS, BLACKSMITHS,  
FORGERS AND HELPERS, DISTRICT NO. 5

BY: Steve Linsky  
(Name/Title)  
Email: boilermakers local 5 @ verizon.net Office No. or Cell: 845-633-4955

THE INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS LOCAL NO. 1

BY: James J. Williams  
(Name/Title)  
Email: williams@brc1ny.com Office No. or Cell: 845-565-8344

NORTH ATLANTIC STATES REGIONAL COUNCIL OF CARPENTERS LOCAL NO. 279

BY: William Barfield Assistant EST  
(Name/Title)  
Email: bbartfield@NASRCC.org Office No. or Cell: 914-393-7418

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS LOCAL NO. 363

BY: Sam Ferrato  
(Name/Title)  
Email: SERRATO@IBEWLU363.ORG Office No. or Cell: 845-216-7023

INTERNATIONAL ASSOCIATION OF HEAT AND FROST INSULATORS AND ALLIED WORKERS  
LOCAL NO. 91

BY: Thomas J. LeCount Business Manager  
(Name/Title)  
Email: awl91@insulators.org Office No. or Cell: (914) 788-0500

INTERNATIONAL ASSOCIATION OF BRIDGE, STRUCTURAL, ORNAMENTAL AND  
REINFORCING IRON WORKERS LOCAL NO. 417

BY: Michael E. Snyder  
(Name/Title)  
Email: gator 417 @ verizon.net Office No. or Cell: 914-443-4991 cell  
845-566-8417 office

LABORERS' INTERNATIONAL UNION OF N.A. LOCAL NO. 17

BY: R. Todd Bu  
(Name/Title)  
Email: tdierie 555@AOL.com Office No. or Cell: 914 474 6222

Vails Gate Fire District



INTERNATIONAL UNION OF OPERATING ENGINEERS LOCAL NO. 825

BY: Wood  
(Name/Title)  
Email: CWood@iooe825.org Office No. or Cell: 908-347-0502

DISTRICT COUNCIL NO. 9 INT'L UNION OF PAINTERS AND ALLIED TRADES, AFL-CIO

BY: Steve Business Rep  
(Name/Title)  
Email: Steve209@aol.com Office No. or Cell: 914 260-1807

PLUMBERS, STEAMFITTERS AND SERVICE TECHNICIANS LOCAL NO. 373

BY: Robert Ruland Bm  
(Name/Title)  
Email: RA373@AOL.com Office No. or Cell: 845-656-8091

INTERNATIONAL ASSOCIATION OF SHEET METAL, AIR, RAIL AND TRANSPORTATION WORKERS (SMART) LOCAL NO. 38

BY: James Nestor Business Rep.  
(Name/Title)  
Email: Unionoffice@smart38.org Office No. or Cell: 203-994-0394

ROAD SPRINKLER FITTERS UNION LOCAL NO. 669

BY: Kurt Kliley  
(Name/Title)  
Email: Kliley669@gmail.com Office No. or Cell: 914-475-9158

TEAMSTERS UNION LOCAL NO. 445

BY: John Business Agent  
(Name/Title)  
Email: JClintman@teamsterunion445.org Office No. or Cell: 845-394-4763

INTERNATIONAL UNION OF ELEVATORS (IUEC) LOCAL NO. 138

BY: MJ Local 138 Bus Rep.  
(Name/Title)  
Email: IUEC138@aol.com Office No. or Cell: 845-332-5280

Vails Gate Fire District

NEW YORK CITY DISTRICT COUNCIL OF CARPENTERS LOCAL NO. 740 AND LOCAL NO. 2287

BY: Joseph Geiger  
(Name/Title)  
Email: J Geiger @ NYC District Council Office No. or Cell: 212-366-7400  
.org

BRICKLAYERS AND ALLIED CRAFTS, TILE, MARBLE & TERRAZZO UNION OF NEW YORK AND NEW JERSEY LOCAL NO. 7

BY: Matthew Sp MATTHEW Sp SECRETARY TREASURER  
(Name/Title)  
Email: mguys@BACLOCAL7.com Office No. or Cell: 718786-7648

UNITED UNION OF ROOFERS, WATERPROOFERS AND ALLIED WORKERS LOCAL NO. 8

BY: Bill Wilmer Business Agent  
(Name/Title)  
Email: W Wilmer @ Roofers 8. org Office No. or Cell: 646 294 1510  
W Wilmer @ AOL.com

UNITED CEMENT MASONS' LOCAL NO. 780

BY: Gino Castagnoli BUSINESS MANAGER  
(Name/Title)  
Email: G Castagnoli @ NOEDC.ORG Office No. or Cell: 718 351-3750

## **APPENDIX C**

### **VAILS GATE FIRE DISTRICT**

**NEW STORAGE BUILDING (Phase 1)  
And  
NEW FIREHOUSE (Phase 2)  
872 BLOOMING GROVE TURNPIKE, NEW YORK 12553**

**2021 REPORT BY H2M architects + engineers**



architects + engineers

290 Broad Hollow Road, Ste 400E  
Melville, NY 11747 | tel 631.756.8000

June 3, 2021

Mr. Thomas Lucchesi  
Superintendent  
Vails Gate Fire District – VGFD2001  
872 Blooming Grove Turnpike  
New Windsor NY 12553

**Re: Environmental Hazardous Materials Survey  
Demolition of Existing Firehouse: Asbestos, Lead and PCB in Sealant Survey  
872 Blooming Grove Turnpike  
New Windsor, NY 12553  
H2M Job No. VGFD2001**

Dear Mr. Lucchesi:

In accordance with your request, H2M architects + engineers (H2M) conducted an asbestos (ACM), lead based/containing paint (LBP/LCP), and polychlorinated biphenyls (PCB) inn sealant inspection at the above-referenced building which is scheduled for full demolition. It is our understanding that the buildings making up this structure were constructed during 4 separate building years. Original building in 1958 and new wing besides the boiler room, 2<sup>nd</sup> Floor Addition building in mid-1970's, Apparatus building in 1982 and New Sheds structures. There is no basement at this firehouse.

Since there are several distinct building sections with different construction dates, each section was sampled and grouped independently to precisely quantify any asbestos findings to that section and material homogeneity, rather than to generalize the whole space. H2M also conducted brick probes at various sections of the buildings with no suspect materials found between the brick wythe layers. Furthermore, bathroom floors were also inspected to rule out or test any vapor barriers that may be present.

### **Asbestos Sampling**

On April 21<sup>st</sup>, May 4<sup>th</sup>, and May 7<sup>th</sup> of 2021, H2M collected limited bulk samples of suspect asbestos containing materials (ACM) that were located at the above-mentioned property and are scheduled to be disturbed during the upcoming project. The materials sampled included various surfacing, miscellaneous, and thermal system insulation. Bulk samples were submitted to EMSL Analytical, Inc. (EMSL) of Carle Place, New York and AmeriSci Group (AmeriSci) of Manhattan, New York. EMSL is certified by the New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP), No. 11469. AmeriSci is certified by the New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP), No. 11480. Bulk samples were collected and submitted by New York State Department of Labor (NYS DOL) certified inspectors Mr. Frank J. Acciarito (NYSDOL Cert. No. 18-63276) and Mr. Douglas B. Milne (NYSDOL Cert. No. 13-14307).

### **Asbestos Results**

According to the federal Asbestos Hazard Emergency Response Act NESHAP (AHERA), the Occupational Safety and Health Administration (OSHA 1926.1101) and the NYSDOL (12 NYCRR Part 56); asbestos containing material (ACM) is defined as any material or product which contains greater than one percent (1%) of asbestos.

| <b>TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS TABLE</b><br><br><b>VAILS GATE FIRE DISTRICT</b><br><b>872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553</b> |                                                    |                         |                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------|--------------------------------------------|
| <b>LOCATION</b>                                                                                                                                                | <b>MATERIAL DESCRIPTION/<br/>SAMPLE HA #</b>       | <b>RESULT FINDINGS</b>  | <b>APPROXIMATE<br/>QUANTITY OF<br/>ACM</b> |
| <b>2<sup>ND</sup> FLOOR ADDITION</b>                                                                                                                           |                                                    |                         |                                            |
| Throughout                                                                                                                                                     | <b>12" x 12" White &amp; Gray Vinyl Floor Tile</b> | <b>ACM</b>              | <b>2,106 S.F.*</b>                         |
|                                                                                                                                                                | 12" x 12" White & Gray Vinyl Floor Tile Mastic     | Non-ACM, Trace          | --                                         |
|                                                                                                                                                                | <b>Wall Gypsum Board</b>                           | <b>ACM Contaminated</b> | <b>3,192 S.F.*</b>                         |
|                                                                                                                                                                | <b>Wall Joint Compound</b>                         | <b>ACM</b>              |                                            |
| Bathroom                                                                                                                                                       | Wall Tile grout                                    | Non-ACM                 | --                                         |
|                                                                                                                                                                | Wall Tile Glue                                     | Non-ACM                 | --                                         |
|                                                                                                                                                                | Floor Tile Grout                                   | Non-ACM                 | --                                         |
|                                                                                                                                                                | Floor Tile Glue                                    | Non-ACM                 | --                                         |
|                                                                                                                                                                | 2' x 2' Old ceiling Tile                           | Non-ACM                 | --                                         |
| <b>Bathroom, Wall Cavity</b>                                                                                                                                   | <b>Thermal System Insulation (TSI), Lagging</b>    | <b>Assumed ACM</b>      | <b>TBD Upon Further Investigation</b>      |
| Commissioner & Chiefs Office                                                                                                                                   | Carpet Mastic                                      | Non-ACM                 | --                                         |
| Staircase/Landings                                                                                                                                             | 2' x 2' Ceiling Tile                               | Non-ACM                 | --                                         |
|                                                                                                                                                                | <b>12" x 12" Tan Vinyl Floor Tile</b>              | <b>ACM</b>              | <b>112 S.F.*</b>                           |
|                                                                                                                                                                | 12" x 12" Tan Vinyl Floor Tile Mastic              | Non-ACM                 | --                                         |
| Staircase Vestibule                                                                                                                                            | Ceramic Floor Tile Setting Bed                     | Non-ACM                 | --                                         |
|                                                                                                                                                                | <b>Ceramic Floor Tile Grout</b>                    | <b>ACM</b>              | <b>54 S.F.*</b>                            |
| Roof                                                                                                                                                           | 1 <sup>st</sup> Top Silver                         | Non-ACM                 | --                                         |
|                                                                                                                                                                | Black 2 <sup>nd</sup> Layer                        | Non-ACM, Trace          | --                                         |
|                                                                                                                                                                | Built up                                           | Non-ACM                 | --                                         |
|                                                                                                                                                                | Fiberboard                                         | Non-ACM                 | --                                         |
|                                                                                                                                                                | Tar Patches                                        | Non-ACM                 | --                                         |
| <b>THREE OFFICE ADD-ONS TO ORIGINAL BAY INTERIOR</b>                                                                                                           |                                                    |                         |                                            |
| Throughout                                                                                                                                                     | Wall Gypsum Board                                  | Non-ACM                 | --                                         |
|                                                                                                                                                                | Wall Joint Compound                                | Non-ACM                 | --                                         |
|                                                                                                                                                                | Ceiling Gypsum Board                               | Non-ACM                 | --                                         |
|                                                                                                                                                                | Ceiling Joint Compound                             | Non-ACM                 | --                                         |

**TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS TABLE**

**VAILS GATE FIRE DISTRICT  
872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553**

| LOCATION                                                             | MATERIAL DESCRIPTION/<br>SAMPLE HA #              | RESULT FINDINGS         | APPROXIMATE<br>QUANTITY OF<br>ACM |
|----------------------------------------------------------------------|---------------------------------------------------|-------------------------|-----------------------------------|
| Throughout                                                           | 12" x 12" White with Blue Vinyl Floor Tile        | Non-ACM                 | --                                |
|                                                                      | 12" x 12" White with Blue Vinyl Floor Tile Mastic | Non-ACM                 | --                                |
|                                                                      | Rolled Rubber Floor Under 12" x 12"               | Non-ACM                 | --                                |
|                                                                      | Blue Cove Base                                    | Non-ACM                 | --                                |
|                                                                      | Blue Cove Base Mastic                             | Non-ACM                 | --                                |
| Laundry and Radio Room                                               | Epoxy Floor                                       | Non-ACM                 | --                                |
| Throughout                                                           | 2' x 2' Ceiling Tile Small Fissure White          | Non-ACM                 | --                                |
|                                                                      | 1' x 1' Ceiling Tile Spline White                 | Non-ACM                 | --                                |
|                                                                      | Window Caulk                                      | Non-ACM                 | --                                |
| Parapet                                                              | Caulk to Parapet                                  | Non-ACM                 | --                                |
| Roof                                                                 | Vapor Barrier under Shingles                      | Non-ACM                 | --                                |
| Roof and Above Stairs                                                | Shingles                                          | Non-ACM                 | --                                |
| Exterior                                                             | Window Caulk                                      | Non-ACM                 | --                                |
| <b>ORIGINAL BLDG.</b>                                                |                                                   |                         |                                   |
| Electric Room                                                        | <b>Braided Wire Insulation</b>                    | <b>Assumed ACM</b>      | <b>25 L.F.</b>                    |
| Lounge/ Office/ Hallway/ Entryway New Bldg./ Parts of both Bathrooms | <b>Ceiling Gypsum Board above Ceiling Tile</b>    | <b>ACM Contaminated</b> | <b>864 S.F.*</b>                  |
|                                                                      | <b>Ceiling Joint Compound above Ceiling Tile</b>  | <b>ACM</b>              |                                   |
| Lounge/ Office/ Hallway/ Entryway New Bldg.                          | 2' x 2' Ceiling Tile Pinhole White                | Non-ACM                 | --                                |
| Lounge / Office                                                      | Brown Cove Base                                   | Non-ACM                 | --                                |
|                                                                      | Brown Cove Base Mastic                            | Non-ACM                 | --                                |
| Bay                                                                  | CMU                                               | Non-ACM                 | --                                |
|                                                                      | CMU Mortar                                        | Non-ACM/Trace           | --                                |
|                                                                      | Epoxy Floor                                       | Non-ACM                 | --                                |
|                                                                      | Yellow Strip on Floor                             | Non-ACM                 | --                                |
|                                                                      | <b>Ceiling Gypsum Board</b>                       | <b>ACM Contaminated</b> | <b>2,052 S.F.*</b>                |
|                                                                      | <b>Joint Compound</b>                             | <b>ACM</b>              |                                   |

**TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS TABLE**

**VAILS GATE FIRE DISTRICT  
872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553**

| LOCATION                            | MATERIAL DESCRIPTION/<br>SAMPLE HA #                                   | RESULT FINDINGS         | APPROXIMATE<br>QUANTITY OF<br>ACM |
|-------------------------------------|------------------------------------------------------------------------|-------------------------|-----------------------------------|
| Office/ Lounge                      | 12" x 12" Vinyl floor Tile<br>White with Blue Streaks                  | Non-ACM                 | --                                |
|                                     | 12" x 12" Vinyl floor Tile<br>White with Blue Streaks<br>Mastic        | Non-ACM                 | --                                |
| Lounge/ Lobby New<br>Bldg.          | Ceramic Stone Tile Mortar                                              | Non-ACM                 | --                                |
|                                     | Ceramic Stone Tile Setting<br>Bed                                      | Non-ACM                 | --                                |
| Boiler Room                         | Fire Stop Mortar                                                       | Non-ACM                 | --                                |
|                                     | Chimney Flu Fire Stop<br>Caulk                                         | Non-ACM                 | --                                |
|                                     | <b>Transite Ceiling</b>                                                | <b>ACM</b>              | <b>117 S.F.*</b>                  |
|                                     | Window Caulk                                                           | Non-ACM                 | --                                |
| Exterior                            | Brick                                                                  | Non-ACM                 | --                                |
|                                     | Brick Mortar                                                           | Non-ACM                 | --                                |
|                                     | Expansion Joint                                                        | Non-ACM                 | --                                |
| Attached Shed<br>Exterior           | Faux Stucco                                                            | Non-ACM                 | --                                |
| Attached Shed<br>Interior           | Glue Dots                                                              | Non-ACM                 | --                                |
|                                     | Fire Brick                                                             | Non-ACM                 | --                                |
|                                     | Fire brick Mortar                                                      | Non-ACM                 | --                                |
|                                     | <b>Gap Caulk</b>                                                       | <b>ACM</b>              | <b>8 L.F.*</b>                    |
| <b>NEW BLDG. BESIDES BOILER RM.</b> |                                                                        |                         |                                   |
| Bar Storage                         | 12" x 12" Vinyl Floor Tile<br>Yellow                                   | <b>ACM</b>              | <b>120S.F.*</b>                   |
|                                     | 12" x 12" Vinyl Floor Tile<br>Yellow Mastic                            | <b>ACM</b>              |                                   |
|                                     | <b>Black Cove Base</b>                                                 | <b>ACM Contaminated</b> | <b>44 L.F.*</b>                   |
|                                     | <b>Black Cove Base Mastic</b>                                          | <b>ACM</b>              |                                   |
| Bar                                 | Carpet Mastic                                                          | Non-ACM                 | --                                |
|                                     | Stucco over Brick                                                      | Non-ACM, Trace          | --                                |
|                                     | Brick                                                                  | Non-ACM                 | --                                |
|                                     | Brick Mortar                                                           | Non-ACM                 | --                                |
|                                     | Green Epoxy Behind Bar                                                 | Non-ACM                 | --                                |
|                                     | <b>Vinyl Floor Tile under<br/>Epoxy Behind Bar and Ice<br/>Machine</b> | <b>ACM</b>              | <b>230 S.F.*</b>                  |

**TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS TABLE**

**VAILS GATE FIRE DISTRICT  
872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553**

| LOCATION                                 | MATERIAL DESCRIPTION/<br>SAMPLE HA #                      | RESULT FINDINGS                       | APPROXIMATE<br>QUANTITY OF<br>ACM         |
|------------------------------------------|-----------------------------------------------------------|---------------------------------------|-------------------------------------------|
|                                          | <b>Vinyl Floor Tile Mastic<br/>under Epoxy Behind Bar</b> | <b>ACM</b>                            |                                           |
| Bathroom Behind Bar                      | Wall Fiberboard                                           | Non-ACM                               | --                                        |
| Meeting Room                             | <b>Pipe Insulation<br/>(Above Soffit Ceiling)</b>         | <b>Assumed ACM<br/>Not Accessible</b> | <b>120 L.F.*<br/>(Visual Aircell)</b>     |
|                                          | Ceiling Soffit Gypsum Board                               | Non-ACM                               | --                                        |
|                                          | Ceiling Soffit Joint<br>Compound                          | Non-ACM                               | --                                        |
|                                          | Wall Gypsum Board                                         | Non-ACM                               | --                                        |
|                                          | Wall Joint Compound                                       | Non-ACM, Trace                        | --                                        |
|                                          | 12" x 12" Vinyl Floor Tile<br>Blue (Top)                  | Non-ACM                               | --                                        |
|                                          | 12" x 12" Vinyl Floor Tile<br>Blue (Top) Mastic           | Non-ACM                               | --                                        |
| Meeting Room                             | 12" x 12" Vinyl Floor Tile<br>White (Top)                 | Non-ACM                               | --                                        |
|                                          | 12" x 12" Vinyl Floor Tile<br>White (Top) Mastic          | Non-ACM                               | --                                        |
|                                          | <b>Vinyl Floor Tile (Bottom)</b>                          | <b>ACM</b>                            | <b>4,560 S.F.*</b>                        |
|                                          | <b>Vinyl Floor Tile (Bottom)<br/>Mastic</b>               | <b>ACM</b>                            |                                           |
| Women's Bathroom                         | Wall Tile Grout                                           | Non-ACM                               | --                                        |
|                                          | Wall Tile Glue                                            | Non-ACM                               | --                                        |
|                                          | Floor Tile Grout                                          | Non-ACM                               | --                                        |
|                                          | Floor Tile Glue                                           | Non-ACM                               | --                                        |
|                                          | Floor Tile Setting Bed                                    | Non-ACM                               | --                                        |
|                                          | Wallboard Behind Tiles                                    | Non-ACM                               | --                                        |
| <b>Women's Bathroom,<br/>Wall Cavity</b> | <b>Thermal System<br/>Insulation (TSI), Lagging</b>       | <b>Assumed ACM</b>                    | <b>TBD Upon Further<br/>Investigation</b> |
| Men's Bathroom                           | Wall Tile Grout                                           | Non-ACM                               | --                                        |
|                                          | Wall Tile Glue                                            | Non-ACM                               | --                                        |
|                                          | Floor Tile Grout                                          | Non-ACM                               | --                                        |
|                                          | Floor Tile Glue                                           | Non-ACM                               | --                                        |
|                                          | Floor Tile Setting Bed                                    | Non-ACM                               | --                                        |
| <b>Men's Bathroom,<br/>Wall Cavity</b>   | <b>Thermal System<br/>Insulation (TSI), Lagging</b>       | <b>Assumed ACM</b>                    | <b>TBD Upon Further<br/>Investigation</b> |



**TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS TABLE**

**VAILS GATE FIRE DISTRICT  
872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553**

| LOCATION                                      | MATERIAL DESCRIPTION/<br>SAMPLE HA #      | RESULT FINDINGS | APPROXIMATE<br>QUANTITY OF<br>ACM |
|-----------------------------------------------|-------------------------------------------|-----------------|-----------------------------------|
| Kitchen & Bathroom                            | Ceiling Gypsum Board Atop Drop-Ceiling    | Non-ACM         | --                                |
|                                               | Ceiling Joint Compound above Drop-Ceiling | Non-ACM         | --                                |
| Kitchen                                       | Floor Tile Grout                          | Non-ACM         | --                                |
|                                               | Floor Tile Mud                            | Non-ACM         | --                                |
| New Building Roof                             | Seam Tar                                  | Non-ACM         | --                                |
|                                               | Top of Parapet Tar                        | Non-ACM         | --                                |
|                                               | <b>Parapet Flashing</b>                   | <b>ACM</b>      | <b>1,200 S.F.*</b>                |
|                                               | <b>HVAC Flashing</b>                      | <b>ACM</b>      | <b>32 L.F.*</b>                   |
|                                               | Silver Top Layer                          | Non-ACM         | --                                |
|                                               | Black 2 <sup>nd</sup> Layer               | Non-ACM, Trace  | --                                |
|                                               | <b>Built Up (Silver)</b>                  | <b>ACM</b>      | <b>6,110 S.F.*</b>                |
|                                               | Fiberboard                                | Non-ACM         | --                                |
|                                               | Tar Patches                               | Non-ACM         | --                                |
| New Building Roof<br>(Over Lounge)            | Top Layer                                 | Non-ACM         | --                                |
|                                               | <b>Built up (Black)</b>                   | <b>ACM</b>      | <b>800 S.F.*</b>                  |
|                                               | Fiberboard                                | Non-ACM         | --                                |
| <b>New Bldg. Roof to 2<sup>nd</sup> Floor</b> | <b>Parapet Flashing</b>                   | <b>ACM</b>      | <b>162 S.F. *</b>                 |
| New Bldg. Roof to New Bay                     | Parapet Caulk on Metal                    | Non-ACM         | --                                |
| Meeting Room<br>Exterior                      | CMU                                       | Non-ACM         | --                                |
|                                               | CMU Mortar                                | Non-ACM         | --                                |
|                                               | Black Window Caulk                        | Non-ACM         | --                                |
|                                               | Silver Door Caulk                         | Non-ACM         | --                                |
| Kitchen                                       | Window Caulk                              | Non-ACM         | --                                |
| <b>NEW BAY WING</b>                           |                                           |                 |                                   |
| Rear Personal Door                            | Foam Mastic Around Door                   | Non-ACM         | --                                |
| Roof                                          | Vapor Barrier                             | Non-ACM         | --                                |
|                                               | Built Up                                  | Non-ACM         | --                                |
|                                               | Fiberboard                                | Non-ACM         | --                                |
|                                               | Vent Tar                                  | Non-ACM         | --                                |
|                                               | Patch tar                                 | Non-ACM         | --                                |

| <b>TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS TABLE</b><br><br><b>VAILS GATE FIRE DISTRICT</b><br><b>872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                        |                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------|--------------------------------------------|
| <b>LOCATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>MATERIAL DESCRIPTION/<br/>SAMPLE HA #</b> | <b>RESULT FINDINGS</b> | <b>APPROXIMATE<br/>QUANTITY OF<br/>ACM</b> |
| Roof                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Parapet Flashing                             | ACM                    | 380 S.F.*                                  |
| Exterior                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CMU                                          | Non-ACM                | --                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CMU Mortar                                   | Non-ACM                | --                                         |
| <b>THROUGHOUT ALL WINGS NEW APPLICATION EXTERIOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                              |                        |                                            |
| 2 Floor/ New Bldg./<br>Original Bldg./<br>New Bay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Stucco                                       | Non-ACM, Trace         | --                                         |
| Throughout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Fire Door Insulation                         | Assumed ACM            | 8 Doors<br>(168 S.F.*)                     |
| Throughout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Green Window Stucco                          | Non-ACM                | --                                         |
| Parking Lot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Asphalt                                      | Non-ACM                | --                                         |
| <b>Table Notes:</b> <ol style="list-style-type: none"> <li>1. ACM = Asbestos Containing Material, contains more than 1% by weight in Bold.</li> <li>2. Non-ACM = Contains ≤1% or no asbestos detected in material samples.</li> <li>3. *All quantities should be verified on site by the contractor prior to submitting a cost estimate or abatement notification/filings.</li> <li>4. Amongst other materials, Exterior Stucco &amp; CMU Mortar contains trace amounts of asbestos less than or equal to 1% and shall be treated with care and under the OSHA Asbestos in Construction Standards, and shall include but not limited to, proper PPE &amp; wet methods during demolition and removals. These materials are NOT considered regulated Asbestos Containing materials (ACM).</li> <li>5. Assumed ACM Materials shall be examined further upon commencement of abatement and if the materials are found to be non-existing or test NONACM, the owner shall receive a credit for these removals line items.</li> </ol> |                                              |                        |                                            |

### **Lead Based Paint Sampling**

On April 21<sup>st</sup>, May 4<sup>th</sup>, and May 7<sup>th</sup> of 2021, H2M collected paint chip samples of suspect lead-based paint from painted surfaces of the Firehouse located at 872 Blooming Grove Turnpike, New Windsor, NY 12553. Sampling was performed by a US EPA Certified Lead Based Paint Risk Assessor, Mr. Frank J. Acciarito (LBP-R-I220104-1).

Paint Chip samples were submitted to EMSL Analytical, Inc. (EMSL) of Carle Place, New York. EMSL is certified by the New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP), No. 11469 and EPA 7000B, AAS.

### **Lead Based Paint Results**

According to the U.S. Environmental Protection Agency (US EPA) lead based paint is defined as paint containing equal to or more than 0.5% lead by weight in paint chip samples. Work practices shall comply with the related lead OSHA guidelines when impacting Lead Containing materials (LCM).

| <b>TABLE 2: LEAD PAINT BULK SAMPLE SUMMARY RESULTS TABLE</b>                           |                            |                  |              |                    |                       |
|----------------------------------------------------------------------------------------|----------------------------|------------------|--------------|--------------------|-----------------------|
| <b>VAILS GATE FIRE DISTRICT<br/>872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553</b> |                            |                  |              |                    |                       |
| <b>Location / Sample #</b>                                                             | <b>Room/Component</b>      | <b>Substrate</b> | <b>Color</b> | <b>% by Weight</b> | <b>Interpretation</b> |
| <b>INTERIORS</b>                                                                       |                            |                  |              |                    |                       |
| 2 <sup>nd</sup> Floor / Sample 1                                                       | Throughout / Wall          | Gypsum Board     | White        | 0.017              | LCM*                  |
| 2 <sup>nd</sup> Floor / Sample 2                                                       | Gym / Wall                 | Wood             | Green        | 0.18               | LCM*                  |
| 2 <sup>nd</sup> Floor / Sample 4                                                       | Gym / Wall                 | Wood             | Yellow       | 0.24               | LCM*                  |
| Original Bldg. / Sample 5                                                              | Lounge/ Door               | Metal            | Brown        | 0.27               | LCM*                  |
| Original Bldg. / Sample 6                                                              | Bay / Wall                 | CMU              | Dark Gray    | 0.036              | LCM*                  |
| Original Bldg. / Sample 7                                                              | Bay / Wall                 | CMU              | Light Gray   | 0.048              | LCM*                  |
| Original Bldg. / Sample 8                                                              | Lounge-Office / Wall       | Gypsum Board     | White        | 0.051              | LCM*                  |
| Add-On Offices / Sample 9                                                              | Throughout / Wall          | Gypsum Board     | White        | 0.040              | LCM*                  |
| Add-On Offices / Sample 10                                                             | Throughout / Doors         | Metal            | Gray         | 0.095              | LCM*                  |
| New Bay / Sample 11                                                                    | Floor                      | Concrete         | Yellow       | 0.060              | LCM*                  |
| New Bay / Sample 12                                                                    | Wall                       | Wood             | Pink         | <0.011             | LCM*                  |
| New Bldg. / Sample 13                                                                  | Meeting Room / Heater      | Metal            | Orange       | <0.086             | LCM*                  |
| <b>New Bldg. / Sample 14</b>                                                           | <b>Kitchen / Doorframe</b> | <b>Metal</b>     | <b>Brown</b> | <b>0.79</b>        | <b>LBP*</b>           |
| New Bldg. / Sample 15                                                                  | Throughout / Ceiling       | Gypsum Board     | White        | <0.0080            | NONLEAD               |
| New Bldg. / Sample 16                                                                  | Throughout / Wall          | Gypsum Board     | White        | <0.0080            | NONLEAD               |
| <b>EXTERIORS</b>                                                                       |                            |                  |              |                    |                       |
| New Bldg. / Sample 17                                                                  | Back Door/ Lintel          | Metal            | Green        | <0.0080            | NONLEAD               |

| TABLE 2: LEAD PAINT BULK SAMPLE SUMMARY RESULTS TABLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |           |       |             |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------|-------|-------------|----------------|
| VAILS GATE FIRE DISTRICT<br>872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |           |       |             |                |
| Location / Sample #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Room/Component  | Substrate | Color | % by Weight | Interpretation |
| Shed Attached to Orig. Bay / Sample 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Interior / Wall | CMU       | Pink  | 0.030       | LCM*           |
| Shed Attached to Orig. Bay / Sample 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Door / Lintel   | Wood      | Green | <0.0080     | NONLEAD        |
| <b>Table Notes:</b><br>1. Lead Based Paint (LBP) in Bold = EPA defined LBP or lead concentration equal to or above 0.5% by weight.<br>2. Lab detection reporting limit is 0.008%<br>* - Lead sample concentration above lab detection limit but below EPA threshold for LBP, refer to OSHA 29 CFR 1926.62 for training and handling guidance of Lead Containing Materials (LCM) or incidentally impacted Lead Based Paint (LBP) during construction. Contractor must hold awareness training and reference OSHA 29 CFR 1926.62 and 29 CFR 1910 in working with LCM including but not limited to wet methods, proper housekeeping, PPE and disposal. |                 |           |       |             |                |

### **Polychlorinated Biphenyls (PCB) in Sealant Sampling**

On April 21<sup>st</sup>, May 4<sup>th</sup>, and May 7<sup>th</sup> of 2021, H2M collected samples of suspect polychlorinated biphenyls (PCB) laden sealants caulks and putty from various surfaces of the windows, doors, brick and patio. Sampling was performed by Mr. Douglas B. Milne & Mr. Frank J. Acciarito.

Bulk samples were submitted to EMSL Analytical, Inc. (EMSL) of Carle Place, New York. EMSL is certified by the New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP), No. 11469 and EPA SW 846 3540C/8082A.

### **Polychlorinated Biphenyls (PCB) Results & Recommendations**

According to the U.S. Environmental Protection Agency (US EPA) EPA TSCA 40 CFR Part 761, samples of suspect PCB is defined as "hazardous" when sample is containing equal to or more than 50 PPM total PCB compound concentration. Proper handling, transportation, and disposal methods are required when a material contains PCB compound concentration of equal to or more than 50 PPM.

Universal Waste, E-waste, and light fixtures potentially containing PCB ballasts; Thermostats and bulbs that may contain mercury; shall be properly disposed of in accordance with local and state regulations.

| TABLE 3: SUSPECT POLYCHLORINATED BIPHENYLS (PCB) BULK SAMPLE SUMMARY RESULTS TABLE                                                                                |                            |            |       |                 |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|-------|-----------------|----------------|
| 872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553                                                                                                                |                            |            |       |                 |                |
| Location / Sample #                                                                                                                                               | Room/Component             | Substrate  | Color | Total PCB (PPM) | Interpretation |
| INTERIORS                                                                                                                                                         |                            |            |       |                 |                |
| Add-On Offices / 1                                                                                                                                                | Throughout / Window Caulk  | Brick      | White | ND              | NONPCB         |
| Original Building / 2                                                                                                                                             | Boiler Room / Window Caulk | CMU        | White | ND              | NONPCB         |
| EXTERIORS                                                                                                                                                         |                            |            |       |                 |                |
| Roof Above Stairs / 1                                                                                                                                             | Caulk to Parapet           | Metal      | White | ND              | NONPCB         |
| New Offices / 2                                                                                                                                                   | Window Caulk               | CMU        | White | ND              | NONPCB         |
| Side of New Bldg. Roof / 3                                                                                                                                        | Parapet Caulk              | Metal      | White | ND              | NONPCB         |
| Meeting Room / 4                                                                                                                                                  | Silver Door Caulk          | Metal      | White | ND              | NONPCB         |
| Meeting Room / 5                                                                                                                                                  | Window Caulk               | CMU        | Black | ND              | NONPCB         |
| Kitchen / 6                                                                                                                                                       | Window Caulk               | CMU        | White | ND              | NONPCB         |
| Original Bay / 7                                                                                                                                                  | Expansion Joint            | Brick      | White | ND              | NONPCB         |
| Attached Shed to Original Bay / 8                                                                                                                                 | Gap Caulk                  | CMU/ Brick | White | ND              | NONPCB         |
| <b>Notes:</b><br>1. Hazardous PCB = $\geq 50$ PPM, as defined by EPA<br>NONPCB = Below hazardous PCB level<br>ND = Not Detected above laboratory reporting limits |                            |            |       |                 |                |

| TABLE 3: SUSPECT POLYCHLORINATED BIPHENYLS (PCB) BULK SAMPLE SUMMARY RESULTS TABLE                                                                                                                                                                                |                |           |       |                 |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|-------|-----------------|----------------|
| 872 BLOOMING GROVE TURNPIKE, NEW WINDSOR, NY 12553                                                                                                                                                                                                                |                |           |       |                 |                |
| Location / Sample #                                                                                                                                                                                                                                               | Room/Component | Substrate | Color | Total PCB (PPM) | Interpretation |
| ** Universal Waste, E-waste, and light fixtures potentially containing PCB ballasts; Thermostats and bulbs that may contain mercury; shall be properly disposed of in accordance to local state and federal regulations and recycling and sanitation departments. |                |           |       |                 |                |

Laboratory analytical data sheets and chain of custody forms are provided in Attachment 1. Copies of H2M's licenses and certifications are provided in Attachment 2. Copies of EMSL's certifications are provided in Attachment 3. Photographic documentation is provided in Attachment 4

H2M surveyed visible and accessible materials during this survey without destructive exploratory means along interiors. H2M certifies that the information contained herein is based on the physical data and visual inspections conducted by H2M and lab data collected during the inspection survey. All findings stated in this report are based upon facts and circumstances as they existed at the time of inspection and at the time that this report was prepared. A change in any of the site conditions, facts or circumstances upon which this report is based may affect the findings expressed in this report.

If you have any questions, please do not hesitate to contact Mr. Anthony Spantidakis at (631) 756-8000 extension 1637.

Very truly yours,  
**H2M architects + engineers**



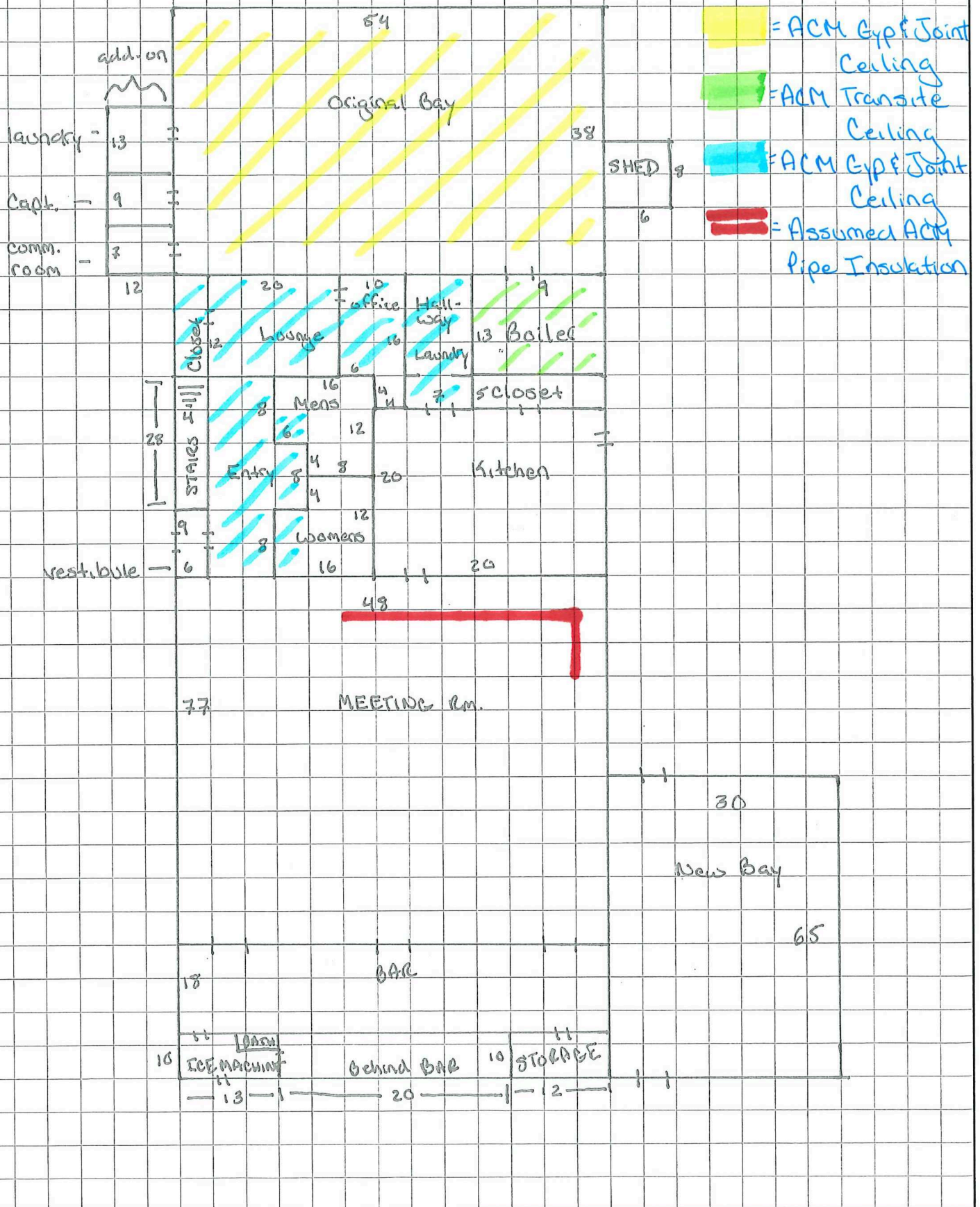
Anthony Spantidakis  
Senior Environmental Scientist



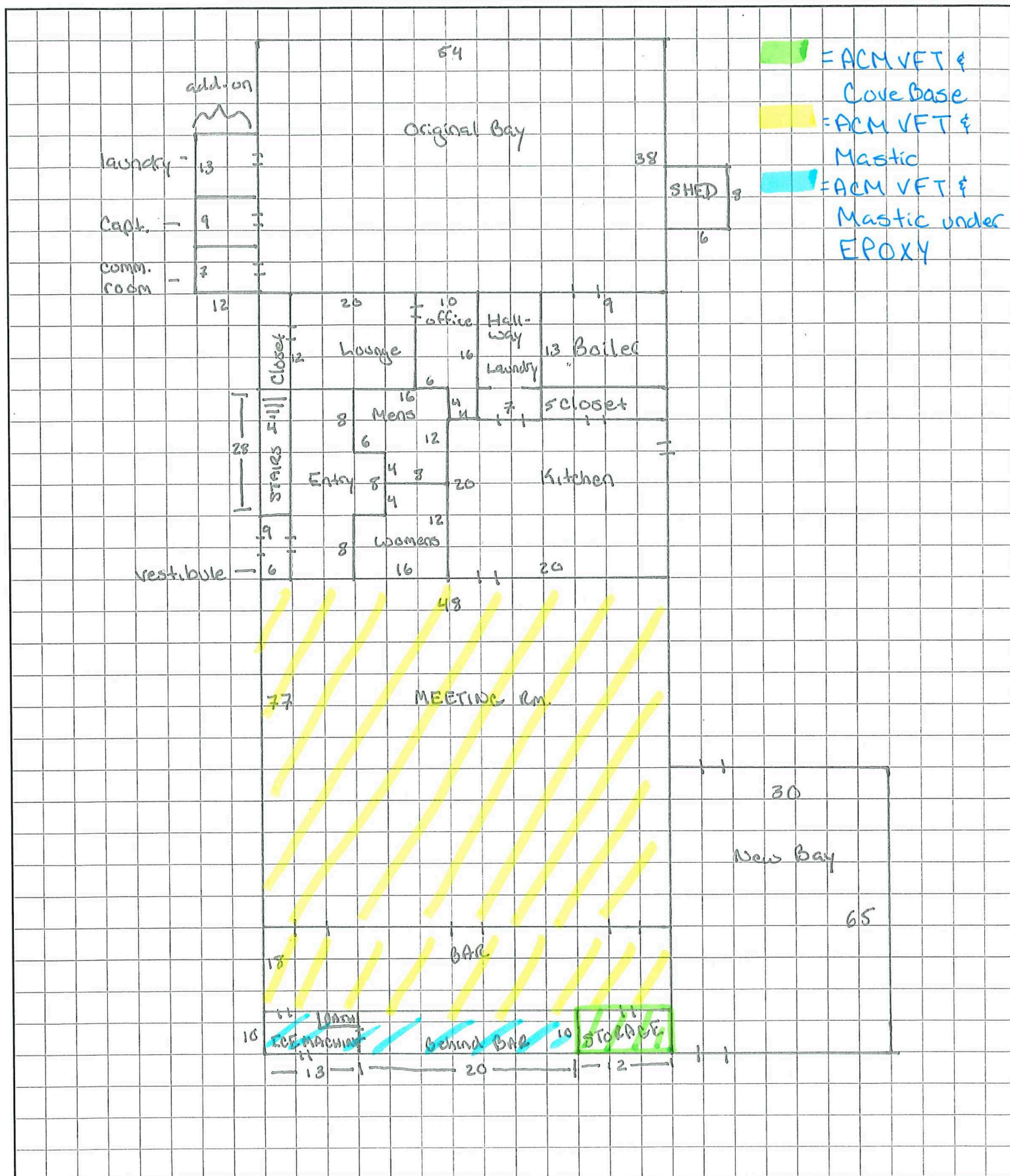
Douglas B. Milne  
Industrial Hygienist

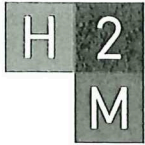






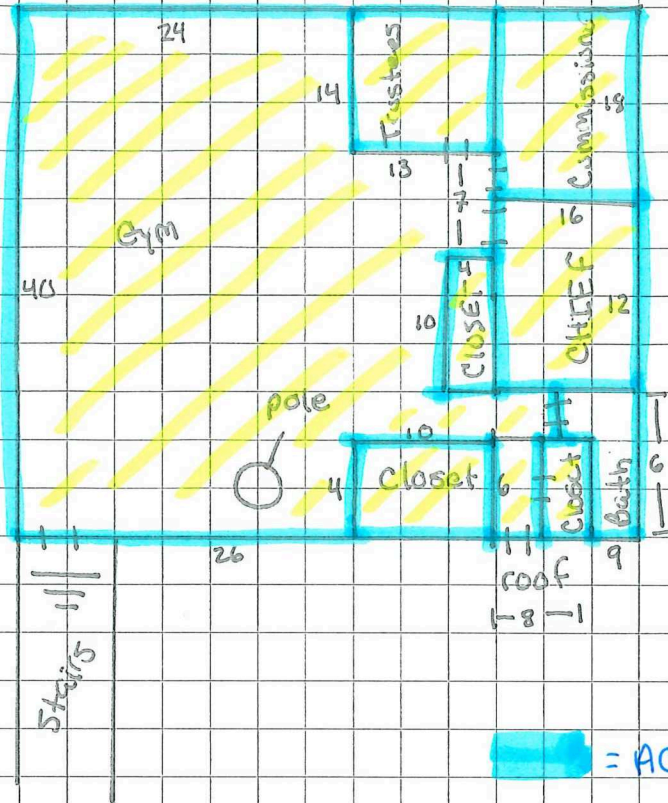


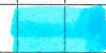





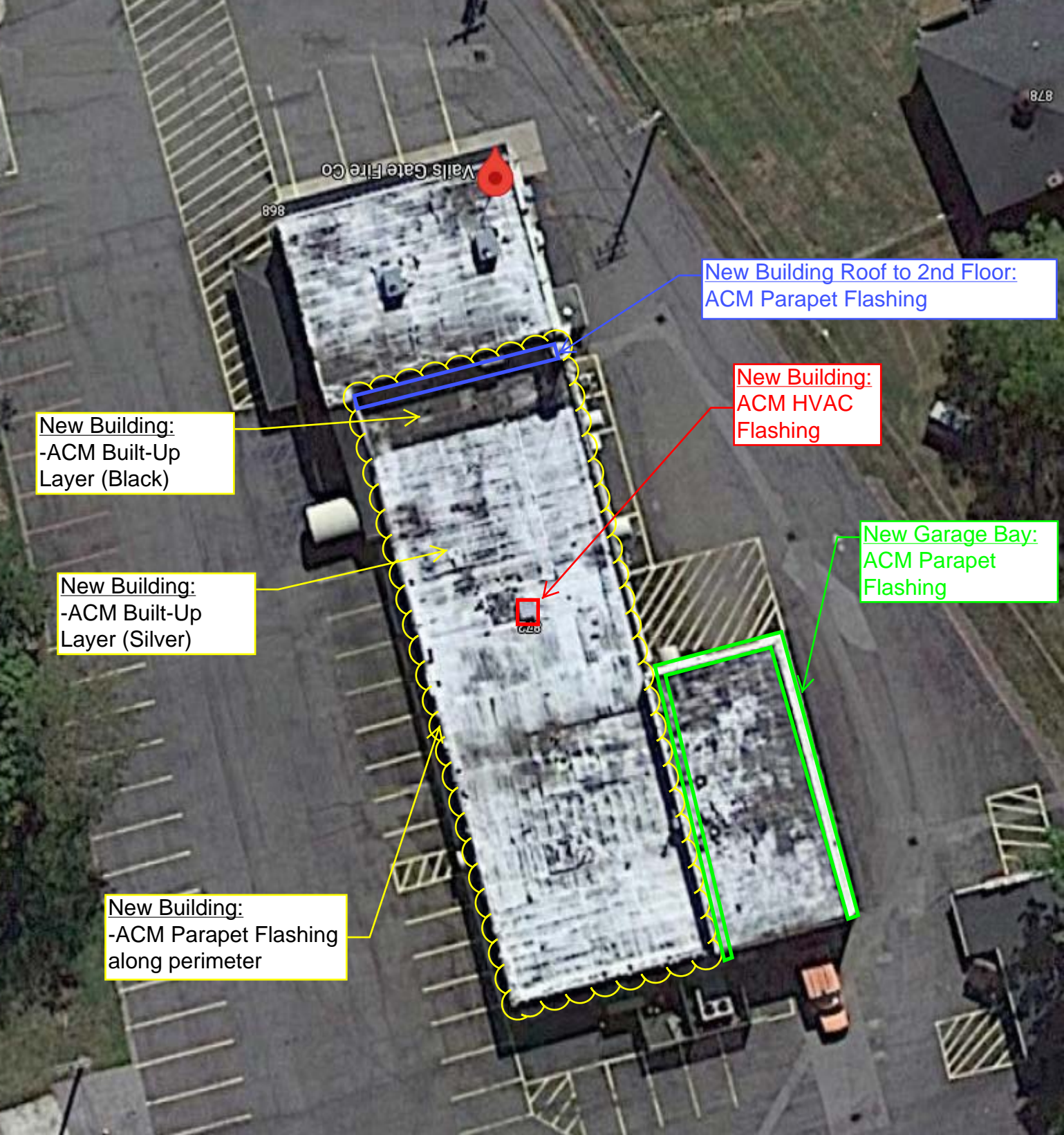
architects + engineers  
practical approach. creative results.

JOB 2nd Floor  
SHEET NO. VGFD2001 OF \_\_\_\_\_  
CALCULATED BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
SCALE \_\_\_\_\_



 = ACM Gyp and Joint Walls  
 = ACM Vinyl Floor Tile





Vails Gate Fire Co

898

New Building Roof to 2nd Floor:  
ACM Parapet Flashing

New Building:  
ACM HVAC  
Flashing

New Garage Bay:  
ACM Parapet  
Flashing

New Building:  
-ACM Built-Up  
Layer (Black)

New Building:  
-ACM Built-Up  
Layer (Silver)

New Building:  
-ACM Parapet Flashing  
along perimeter

**ATTACHMENT 1**

LABORATORY ANALYSIS  
&  
CHAIN OF CUSTODY FORM



**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn:

**K. VanderSchuyt  
H2M Architects and Engineers  
538 Broad Hollow Road  
4th Floor East  
Melville, NY 11747**

Phone: (631) 756-8000

Fax:

4/30/2021

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 4/23/2021. The results are tabulated on the attached data pages for the following client designated project:

**872 Blooming Grove Tpke, New Windsor, NY**

The reference number for these samples is EMSL Order #012104148. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry  
Laboratory Director



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.

NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>[EnvChemistry2@emsl.com](mailto:EnvChemistry2@emsl.com)

EMSL Order: 012104148

CustomerID: H2ML50

CustomerPO:

ProjectID:

Attn: **K. VanderSchuyt**  
**H2M Architects and Engineers**  
**538 Broad Hollow Road**  
**4th Floor East**  
**Melville, NY 11747**

Phone: (631) 756-8000

Fax:

Received: 4/23/2021 09:25 AM

Project: 872 Blooming Grove Tpke, New Windsor, NY

**Analytical Results**

**Client Sample Description** 1 **Collected:** 4/22/2021 **Lab ID:** 012104148-0001  
Office Additions (interior)

| Method         | Parameter    | Result | RL Units  | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|-----------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |           |                        |                            |
| 3540C/8082A    | Aroclor-1016 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1221 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1232 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1242 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1248 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1254 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1260 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1262 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1268 | ND D   | 1.0 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |

**Client Sample Description** 2 **Collected:** 4/22/2021 **Lab ID:** 012104148-0002  
Original Bay Boiler Room

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3540C/8082A    | Aroclor-1016 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1221 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1232 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1242 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1248 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1254 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1260 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |
| 3540C/8082A    | Aroclor-1262 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021 00:00 EH         |

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>[EnvChemistry2@emsl.com](mailto:EnvChemistry2@emsl.com)

EMSL Order: 012104148

CustomerID: H2ML50

CustomerPO:

ProjectID:

Attn: **K. VanderSchuyt**  
**H2M Architects and Engineers**  
**538 Broad Hollow Road**  
**4th Floor East**  
**Melville, NY 11747**

Phone: (631) 756-8000

Fax:

Received: 4/23/2021 09:25 AM

Project: 872 Blooming Grove Tpke, New Windsor, NY

**Analytical Results**

**Client Sample Description** 2 **Collected:** 4/22/2021 **Lab ID:** 012104148-0002  
Original Bay Boiler Room

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3540C/8082A    | Aroclor-1268 | ND D   | 0.96 mg/Kg | 4/26/2021 OM           | 4/27/2021<br>00:00 EH      |

**Definitions:**

MDL - method detection limit

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit

RL - Reporting Limit (Analytical)

D - Dilution Sample required a dilution which was used to calculate final results



## Bulk Sheet and Chain of Custody

PCB's

RECEIVED  
ENST. ANALYTICAL, INC.  
CARTERPLACE, NY  
21 APR 22 PM 3:43

EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528





**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn:

**Kyle Vanderschuyt  
H2M Architects and Engineers  
538 Broad Hollow Road  
4th Floor East  
Melville, NY 11747**

Phone: (631) 756-8000

Fax:

5/17/2021

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 5/10/2021. The results are tabulated on the attached data pages for the following client designated project:

**872 Blooming Grove, New Windsor Firehouse Exterior VGFD2001**

The reference number for these samples is EMSL Order #012104823. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry  
Laboratory Director



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.

NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>[EnvChemistry2@emsl.com](mailto:EnvChemistry2@emsl.com)

EMSL Order: 012104823

CustomerID: H2ML50

CustomerPO:

ProjectID:

Attn: **Kyle Vanderschuyt**  
**H2M Architects and Engineers**  
**538 Broad Hollow Road**  
**4th Floor East**  
**Melville, NY 11747**

Phone: (631) 756-8000

Fax:

Received: 5/10/2021 09:00 AM

Project: 872 Blooming Grove, New Windsor Firehouse Exterior VGFD2001

**Analytical Results**

**Client Sample Description** 1 **Collected:** 5/4/2021 **Lab ID:** 012104823-0001  
 Roof above stairs

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

**Client Sample Description** 2 **Collected:** 5/4/2021 **Lab ID:** 012104823-0002  
 New offices ext.

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

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EMSL Order: 012104823

CustomerID: H2ML50

CustomerPO:

ProjectID:

Attn: **Kyle Vanderschuyt**  
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Received: 5/10/2021 09:00 AM

Project: 872 Blooming Grove, New Windsor Firehouse Exterior VGFD2001

**Analytical Results**

**Client Sample Description** 2 **Collected:** 5/4/2021 **Lab ID:** 012104823-0002  
 New offices ext.

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.77 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

**Client Sample Description** 3 **Collected:** 5/4/2021 **Lab ID:** 012104823-0003  
 Side of new Bldg roof

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.96 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

**Client Sample Description** 4 **Collected:** 5/4/2021 **Lab ID:** 012104823-0004  
 Meeting room

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.95 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.95 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.95 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.95 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

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Received: 5/10/2021 09:00 AM

Project: 872 Blooming Grove, New Windsor Firehouse Exterior VGFD2001

**Analytical Results**

**Client Sample Description** 4 Meeting room **Collected:** 5/4/2021 **Lab ID:** 012104823-0004

| Method         | Parameter    | Result | RL Units   | Prep Date & Analyst | Analysis Date & Analyst |
|----------------|--------------|--------|------------|---------------------|-------------------------|
| <b>GC-SVOA</b> |              |        |            |                     |                         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.95 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.95 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.95 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.95 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.95 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |

**Client Sample Description** 5 Meeting room **Collected:** 5/4/2021 **Lab ID:** 012104823-0005

| Method         | Parameter    | Result | RL Units   | Prep Date & Analyst | Analysis Date & Analyst |
|----------------|--------------|--------|------------|---------------------|-------------------------|
| <b>GC-SVOA</b> |              |        |            |                     |                         |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.81 mg/Kg | 5/11/2021 OM        | 5/11/2021 00:00 EH      |

**Client Sample Description** 6 Kitchen **Collected:** 5/4/2021 **Lab ID:** 012104823-0006

| Method         | Parameter | Result | RL Units | Prep Date & Analyst | Analysis Date & Analyst |
|----------------|-----------|--------|----------|---------------------|-------------------------|
| <b>GC-SVOA</b> |           |        |          |                     |                         |

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Received: 5/10/2021 09:00 AM

Project: 872 Blooming Grove, New Windsor Firehouse Exterior VGFD2001

**Analytical Results**

**Client Sample Description** 6  
Kitchen  
**Collected:** 5/4/2021  
**Lab ID:** 012104823-0006

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

**Client Sample Description** 7  
Orig Bay  
**Collected:** 5/4/2021  
**Lab ID:** 012104823-0007

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

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EMSL Order: 012104823

CustomerID: H2ML50

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ProjectID:

Attn: **Kyle Vanderschuyt**  
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Phone: (631) 756-8000  
Fax:  
Received: 5/10/2021 09:00 AM

Project: 872 Blooming Grove, New Windsor Firehouse Exterior VGFD2001

**Analytical Results**

**Client Sample Description** 7  
Orig Bay  
**Collected:** 5/4/2021  
**Lab ID:** 012104823-0007

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.94 mg/Kg | 5/11/2021 OM           | 5/11/2021 00:00 EH         |

**Client Sample Description** 8  
Shed to orig Bay  
**Collected:** 5/4/2021  
**Lab ID:** 012104823-0008

| Method         | Parameter    | Result | RL Units   | Prep<br>Date & Analyst | Analysis<br>Date & Analyst |
|----------------|--------------|--------|------------|------------------------|----------------------------|
| <b>GC-SVOA</b> |              |        |            |                        |                            |
| 3546/8082A     | Aroclor-1016 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1221 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1232 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1242 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1248 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1254 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1260 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1262 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |
| 3546/8082A     | Aroclor-1268 | ND D   | 0.92 mg/Kg | 5/11/2021 OM           | 5/12/2021 00:00 EH         |

**Definitions:**

MDL - method detection limit

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit

RL - Reporting Limit (Analytical)

D - Dilution Sample required a dilution which was used to calculate final results



Page\_\_\_\_\_ OF \_\_\_\_\_

116.4°C  
ice pack  
rec'd in plastic



# EMSL Analytical, Inc.

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

Attention: Kyle Vanderschuyt

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Melville, NY 11747

Phone: (631) 756-8000

Fax:

Received Date: 04/22/2021 3:42 PM

Analysis Date: 04/23/2021 - 04/29/2021

Collected Date: 04/22/2021

Project: 872 Blooming Grove Tpke., New Windsor, NY, Entire Firehouse Interior

## Test Report: Asbestos Analysis of Bulk Material

| Test                            | Analyzed Date | Color                      | Non-Asbestos                                                    |                                                                   | Asbestos                     |
|---------------------------------|---------------|----------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------|------------------------------|
|                                 |               |                            | Fibrous                                                         | Non-Fibrous                                                       |                              |
| Sample ID 1-1<br>062107143-0001 |               | Description<br>Homogeneity | Stair Vestibule - Ceramic Floor Tile Setting Bed<br>Homogeneous |                                                                   |                              |
| PLM NYS 198.1 Friable           | 04/23/2021    | Gray                       |                                                                 | 59.00% Ca Carbonate<br>6.00% Non-fibrous (other)<br>35.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| Sample ID 1-2<br>062107143-0002 |               | Description<br>Homogeneity | Stair Vestibule - Ceramic Floor Tile Setting Bed<br>Homogeneous |                                                                   |                              |
| PLM NYS 198.1 Friable           | 04/23/2021    | Gray                       |                                                                 | 42.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>53.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| Sample ID 2-1<br>062107143-0003 |               | Description<br>Homogeneity | Stair Vestibule - Ceramic Floor Tile Grout<br>Homogeneous       |                                                                   |                              |
| PLM NYS 198.1 Friable           | 04/23/2021    | Gray                       | None                                                            | 82.00% Ca Carbonate<br>6.00% Non-fibrous (other)<br>10.00% Quartz | 2.00% Chrysotile             |
| PLM NYS 198.6 VCM               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| Sample ID 2-2<br>062107143-0004 |               | Description<br>Homogeneity | Stair Vestibule - Ceramic Floor Tile Grout                      |                                                                   |                              |
| PLM NYS 198.1 Friable           | 04/23/2021    |                            |                                                                 |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| Sample ID 3-1<br>062107143-0005 |               | Description<br>Homogeneity | Staircase - 12" x 12" VFT - Tan<br>Homogeneous                  |                                                                   |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                 |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Brown/ Tan                 | None                                                            | 95.40% Other                                                      | 4.60% Chrysotile             |
| TEM NYS 198.4 NOB               |               |                            |                                                                 |                                                                   | Not Analyzed                 |

Initial report from: 04/28/2021 03:52:10





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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                            | Analyzed Date | Color                      | Non-Asbestos                                                       |               | Asbestos                     |
|---------------------------------|---------------|----------------------------|--------------------------------------------------------------------|---------------|------------------------------|
|                                 |               |                            | Fibrous                                                            | Non-Fibrous   |                              |
| Sample ID 3-2<br>062107143-0006 |               | Description<br>Homogeneity | Staircase - 12" x 12" VFT - Tan                                    |               |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    |                            |                                                                    |               | Positive Stop (Not Analyzed) |
| TEM NYS 198.4 NOB               |               |                            |                                                                    |               | Not Analyzed                 |
| Sample ID 4-1<br>062107143-0007 |               | Description<br>Homogeneity | Staircase - 12" x 12" VFT - Tan - Mastic<br>Homogeneous            |               |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Black                      |                                                                    | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Black                      |                                                                    | 100.00% Other | None Detected                |
| Sample ID 4-2<br>062107143-0008 |               | Description<br>Homogeneity | Staircase - 12" x 12" VFT - Tan - Mastic<br>Homogeneous            |               |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Black                      |                                                                    | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Black                      |                                                                    | 100.00% Other | None Detected                |
| Sample ID 5-1<br>062107143-0009 |               | Description<br>Homogeneity | New Bay - Foam Mastic around Door<br>Homogeneous                   |               |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Tan                        |                                                                    | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Tan                        |                                                                    | 100.00% Other | None Detected                |
| Sample ID 5-2<br>062107143-0010 |               | Description<br>Homogeneity | New Bay - Foam Mastic around Door<br>Homogeneous                   |               |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Tan                        |                                                                    | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Tan                        |                                                                    | 100.00% Other | None Detected                |
| Sample ID 6-1<br>062107143-0011 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - 12" x 12" VFT - White & Gray<br>Homogeneous |               |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                                    |               | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Gray/ White                | None                                                               | 98.10% Other  | 1.90% Chrysotile             |
| TEM NYS 198.4 NOB               |               |                            |                                                                    |               | Not Analyzed                 |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                            | Analyzed Date | Color                      | Non-Asbestos                                                 |                                                                   | Asbestos                     |
|---------------------------------|---------------|----------------------------|--------------------------------------------------------------|-------------------------------------------------------------------|------------------------------|
|                                 |               |                            | Fibrous                                                      | Non-Fibrous                                                       |                              |
| Sample ID 6-2<br>062107143-0012 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - 12" x 12" VFT - White & Gray          |                                                                   |                              |
| PLM NYS 198.1 Friable           |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    |                            |                                                              |                                                                   | Positive Stop (Not Analyzed) |
| TEM NYS 198.4 NOB               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| Sample ID 7-1<br>062107143-0013 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - 12" x 12" VFT - White & Gray - Mastic |                                                                   |                              |
| PLM NYS 198.1 Friable           |               |                            | Heterogeneous/Homogeneous                                    |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Tan/ Black                 |                                                              | 100.00% Other                                                     | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Tan/ Black                 | None                                                         | 100.00% Other                                                     | <1% Chrysotile               |
| Sample ID 7-2<br>062107143-0014 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - 12" x 12" VFT - White & Gray - Mastic |                                                                   |                              |
| PLM NYS 198.1 Friable           |               |                            | Heterogeneous/Homogeneous                                    |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Tan/ Black                 |                                                              | 100.00% Other                                                     | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Tan/ Black                 | None                                                         | 100.00% Other                                                     | <1% Chrysotile               |
| Sample ID 8-1<br>062107143-0015 |               | Description<br>Homogeneity | 2nd Fl. - Bathroom - Wall Tile Grout                         |                                                                   |                              |
| PLM NYS 198.1 Friable           | 04/23/2021    | White                      |                                                              | 50.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>45.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| Sample ID 8-2<br>062107143-0016 |               | Description<br>Homogeneity | 2nd Fl. - Bathroom - Wall Tile Grout                         |                                                                   |                              |
| PLM NYS 198.1 Friable           | 04/23/2021    | White                      |                                                              | 52.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>43.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| Sample ID 9-1<br>062107143-0017 |               | Description<br>Homogeneity | 2nd Fl. - Bathroom - Wall Tile Glue                          |                                                                   |                              |
| PLM NYS 198.1 Friable           |               |                            | Homogeneous                                                  |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM               |               |                            |                                                              |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB               | 04/26/2021    | Yellow                     |                                                              | 100.00% Other                                                     | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB               | 04/28/2021    | Yellow                     |                                                              | 100.00% Other                                                     | None Detected                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

|                                  |               | Non-Asbestos |                                            |                                                                   |                             |
|----------------------------------|---------------|--------------|--------------------------------------------|-------------------------------------------------------------------|-----------------------------|
| Test                             | Analyzed Date | Color        | Fibrous                                    | Non-Fibrous                                                       | Asbestos                    |
| Sample ID 9-2<br>062107143-0018  |               | Description  | 2nd Fl. - Bathroom - Wall Tile Glue        |                                                                   |                             |
|                                  |               | Homogeneity  | Homogeneous                                |                                                                   |                             |
| PLM NYS 198.1 Friable            |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Yellow       |                                            | 100.00% Other                                                     | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Yellow       |                                            | 100.00% Other                                                     | None Detected               |
| Sample ID 10-1<br>062107143-0019 |               | Description  | 2nd Fl. - Bathroom - Floor Tile Grout      |                                                                   |                             |
|                                  |               | Homogeneity  | Homogeneous                                |                                                                   |                             |
| PLM NYS 198.1 Friable            | 04/23/2021    | Brown/ Gray  |                                            | 40.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>55.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                            |                                                                   | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                            |                                                                   | Not Analyzed                |
| Sample ID 10-2<br>062107143-0020 |               | Description  | 2nd Fl. - Bathroom - Floor Tile Grout      |                                                                   |                             |
|                                  |               | Homogeneity  | Homogeneous                                |                                                                   |                             |
| PLM NYS 198.1 Friable            | 04/23/2021    | Gray/ White  |                                            | 45.00% Ca Carbonate<br>4.00% Non-fibrous (other)<br>51.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                            |                                                                   | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                            |                                                                   | Not Analyzed                |
| Sample ID 11-1<br>062107143-0021 |               | Description  | 2nd Fl. - Bathroom - Floor Tile Glue       |                                                                   |                             |
|                                  |               | Homogeneity  | Homogeneous                                |                                                                   |                             |
| PLM NYS 198.1 Friable            |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan/ Yellow  |                                            | 100.00% Other                                                     | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Tan/ Yellow  |                                            | 100.00% Other                                                     | None Detected               |
| Sample ID 11-2<br>062107143-0022 |               | Description  | 2nd Fl. - Bathroom - Floor Tile Glue       |                                                                   |                             |
|                                  |               | Homogeneity  | Homogeneous                                |                                                                   |                             |
| PLM NYS 198.1 Friable            |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan/ Yellow  |                                            | 100.00% Other                                                     | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Tan/ Yellow  |                                            | 100.00% Other                                                     | None Detected               |
| Sample ID 12-1<br>062107143-0023 |               | Description  | 2nd Fl. - Throughout - Wall Joint Compound |                                                                   |                             |
|                                  |               | Homogeneity  | Heterogeneous                              |                                                                   |                             |
| PLM NYS 198.1 Friable            | 04/23/2021    | Tan/ White   | 15.00% Cellulose                           | 75.00% Ca Carbonate<br>4.00% Mica<br>4.70% Non-fibrous (other)    | 1.30% Chrysotile            |
| PLM NYS 198.6 VCM                |               |              |                                            |                                                                   | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                            |                                                                   | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                            |                                                                   | Not Analyzed                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                               |                                                                  | Asbestos                     |
|----------------------------------|---------------|----------------------------|--------------------------------------------|------------------------------------------------------------------|------------------------------|
|                                  |               |                            | Fibrous                                    | Non-Fibrous                                                      |                              |
| Sample ID 12-2<br>062107143-0024 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - Wall Joint Compound |                                                                  |                              |
| PLM NYS 198.1 Friable            | 04/23/2021    |                            |                                            |                                                                  | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                            |                                                                  | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| Sample ID 12-3<br>062107143-0025 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - Wall Joint Compound |                                                                  |                              |
| PLM NYS 198.1 Friable            | 04/23/2021    |                            |                                            |                                                                  | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                            |                                                                  | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| Sample ID 12-4<br>062107143-0026 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - Wall Joint Compound |                                                                  |                              |
| PLM NYS 198.1 Friable            | 04/23/2021    |                            |                                            |                                                                  | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                            |                                                                  | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| Sample ID 12-5<br>062107143-0027 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - Wall Joint Compound |                                                                  |                              |
| PLM NYS 198.1 Friable            | 04/23/2021    |                            |                                            |                                                                  | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                            |                                                                  | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| Sample ID 13-1<br>062107143-0028 |               | Description<br>Homogeneity | 2nd Fl. - Throughout - Wall Gypsum Board   |                                                                  |                              |
| PLM NYS 198.1 Friable            | 04/23/2021    | Gray/ Tan                  | 7.00% Cellulose                            | 8.00% Ca Carbonate<br>80.00% Gypsum<br>5.00% Non-fibrous (other) | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                            |                                                                  | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| Sample ID 13-2<br>062107143-0029 |               | Description<br>Homogeneity | 2nd Fl. - Staircase - Wall Gypsum Board    |                                                                  |                              |
| PLM NYS 198.1 Friable            | 04/23/2021    | Gray/ Tan                  | 9.00% Cellulose                            | 9.00% Ca Carbonate<br>78.00% Gypsum<br>4.00% Non-fibrous (other) | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                            |                                                                  | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                            |                                                                  | Not Analyzed                 |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                               |                                                                  | Asbestos                    |
|----------------------------------|---------------|----------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                    | Non-Fibrous                                                      |                             |
| Sample ID 14-1<br>062107143-0030 |               | Description<br>Homogeneity | 2nd Fl. - Staircase - 2' x 2' Ceiling Tile<br>Heterogeneous/Homogeneous    |                                                                  |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | None Detected               |
| Sample ID 14-2<br>062107143-0031 |               | Description<br>Homogeneity | 2nd Fl. - Bathroom - 2' x 2' Ceiling Tile<br>Heterogeneous/Homogeneous     |                                                                  |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | None Detected               |
| Sample ID 15-1<br>062107143-0032 |               | Description<br>Homogeneity | 2nd Fl. - Bathroom - 2' x 2' Old Ceiling Tile<br>Heterogeneous/Homogeneous |                                                                  |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | None Detected               |
| Sample ID 15-2<br>062107143-0033 |               | Description<br>Homogeneity | 2nd Fl. - Bathroom - 2' x 2' Old Ceiling Tile<br>Heterogeneous/Homogeneous |                                                                  |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                            | 100.00% Other                                                    | None Detected               |
| Sample ID 16-1<br>062107143-0034 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Wall Gypsum Board<br>Heterogeneous             |                                                                  |                             |
| PLM NYS 198.1 Friable            | 04/23/2021    | Gray/ Tan                  | 8.00% Cellulose                                                            | 8.00% Ca Carbonate<br>80.00% Gypsum<br>4.00% Non-fibrous (other) | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| Sample ID 16-2<br>062107143-0035 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Wall Gypsum Board<br>Heterogeneous             |                                                                  |                             |
| PLM NYS 198.1 Friable            | 04/23/2021    | Gray/ Tan                  | 9.00% Cellulose                                                            | 8.00% Ca Carbonate<br>78.00% Gypsum<br>5.00% Non-fibrous (other) | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                            |                                                                  | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                            |                                                                  | Not Analyzed                |

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EMSL Order: 062107143

Customer ID: H2ML50

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## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color       | Non-Asbestos                                                                              |                                                                   | Asbestos      |
|----------------------------------|---------------|-------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------|
|                                  |               |             | Fibrous                                                                                   | Non-Fibrous                                                       |               |
| Sample ID 17-1<br>062107143-0036 |               |             | Description Office Add-On - Orig. Bay - Wall Joint Compound<br>Homogeneity Heterogeneous  |                                                                   |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White       |                                                                                           | 89.00% Ca Carbonate<br>4.00% Mica<br>7.00% Non-fibrous (other)    | None Detected |
| PLM NYS 198.6 VCM                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| Sample ID 17-2<br>062107143-0037 |               |             | Description Office Add-On - Orig. Bay - Wall Joint Compound<br>Homogeneity Heterogeneous  |                                                                   |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White       |                                                                                           | 88.00% Ca Carbonate<br>5.00% Mica<br>7.00% Non-fibrous (other)    | None Detected |
| PLM NYS 198.6 VCM                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| Sample ID 17-3<br>062107143-0038 |               |             | Description Office Add-On - Orig. Bay - Wall Joint Compound<br>Homogeneity Heterogeneous  |                                                                   |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White       |                                                                                           | 89.00% Ca Carbonate<br>8.00% Mica<br>3.00% Non-fibrous (other)    | None Detected |
| PLM NYS 198.6 VCM                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| Sample ID 18-1<br>062107143-0039 |               |             | Description Office Add-On - Orig. Bay - Ceiling Gypsum Board<br>Homogeneity Heterogeneous |                                                                   |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | Brown/ Gray | 4.00% Cellulose                                                                           | 10.00% Ca Carbonate<br>80.00% Gypsum<br>6.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| Sample ID 18-2<br>062107143-0040 |               |             | Description Office Add-On - Orig. Bay - Ceiling Gypsum Board<br>Homogeneity Heterogeneous |                                                                   |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | Brown/ Gray | 3.00% Cellulose                                                                           | 10.00% Ca Carbonate<br>79.00% Gypsum<br>8.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |             |                                                                                           |                                                                   | Not Analyzed  |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color              | Non-Asbestos                                                                     |                                                                | Asbestos                           |
|-----------------------------------------|---------------|--------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------|------------------------------------|
|                                         |               |                    | Fibrous                                                                          | Non-Fibrous                                                    |                                    |
| <b>Sample ID</b> 19-1<br>062107143-0041 |               | <b>Description</b> | Office Add-On - Orig. Bay - Ceiling Joint Compound                               |                                                                |                                    |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                                    |                                                                |                                    |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White              |                                                                                  | 92.00% Ca Carbonate<br>3.00% Mica<br>5.00% Non-fibrous (other) | <b>None Detected</b>               |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>Sample ID</b> 19-2<br>062107143-0042 |               | <b>Description</b> | Office Add-On - Orig. Bay - Ceiling Joint Compound                               |                                                                |                                    |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                                    |                                                                |                                    |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White              |                                                                                  | 89.00% Ca Carbonate<br>4.00% Mica<br>7.00% Non-fibrous (other) | <b>None Detected</b>               |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>Sample ID</b> 19-3<br>062107143-0043 |               | <b>Description</b> | Office Add-On - Orig. Bay - Ceiling Joint Compound                               |                                                                |                                    |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                                    |                                                                |                                    |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White              |                                                                                  | 88.00% Ca Carbonate<br>4.00% Mica<br>8.00% Non-fibrous (other) | <b>None Detected</b>               |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>Sample ID</b> 20-1<br>062107143-0044 |               | <b>Description</b> | Office Add-On - Orig. Bay - Capt. Office - 12" x 12" VFT White w./ Blue          |                                                                |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                                      |                                                                |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | White              |                                                                                  | 100.00% Other                                                  | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/28/2021    | White              |                                                                                  | 100.00% Other                                                  | <b>None Detected</b>               |
| <b>Sample ID</b> 20-2<br>062107143-0045 |               | <b>Description</b> | Office Add-On - Orig. Bay - Capt. Office - 12" x 12" VFT White w./ Blue          |                                                                |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                                      |                                                                |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | White              |                                                                                  | 100.00% Other                                                  | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/28/2021    | White              |                                                                                  | 100.00% Other                                                  | <b>None Detected</b>               |
| <b>Sample ID</b> 21-1<br>062107143-0046 |               | <b>Description</b> | Office Add-On - Orig. Bay - Capt. Office - 12" x 12" VFT White w./ Blue - Mastic |                                                                |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                                      |                                                                |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                                  |                                                                | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Tan                |                                                                                  | 100.00% Other                                                  | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/28/2021    | Tan                |                                                                                  | 100.00% Other                                                  | <b>None Detected</b>               |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                                    |               | Asbestos                    |
|----------------------------------|---------------|----------------------------|-------------------------------------------------------------------------------------------------|---------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                                         | Non-Fibrous   |                             |
| Sample ID 21-2<br>062107143-0047 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Capt. Office - 12" x 12" VFT White w./ Blue - Mastic<br>Homogeneous |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan/ Yellow                |                                                                                                 | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Tan/ Yellow                |                                                                                                 | 100.00% Other | None Detected               |
| Sample ID 22-1<br>062107143-0048 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Rolled Rubber Floor under 12" x 12"<br>Homogeneous                  |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Brown                      |                                                                                                 | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Brown                      |                                                                                                 | 100.00% Other | None Detected               |
| Sample ID 22-2<br>062107143-0049 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Rolled Rubber Floor under 12" x 12"<br>Homogeneous                  |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Brown                      |                                                                                                 | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Brown                      |                                                                                                 | 100.00% Other | None Detected               |
| Sample ID 23-1<br>062107143-0050 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Epoxy Floor<br>Heterogeneous/Homogeneous                            |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ Green                |                                                                                                 | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ Green                |                                                                                                 | 100.00% Other | None Detected               |
| Sample ID 23-2<br>062107143-0051 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Epoxy Floor<br>Heterogeneous/Homogeneous                            |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ Green                |                                                                                                 | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ Green                |                                                                                                 | 100.00% Other | None Detected               |
| Sample ID 24-1<br>062107143-0052 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Capt. Office - Blue Cove Base<br>Homogeneous                        |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                 |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Blue                       |                                                                                                 | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Blue                       |                                                                                                 | 100.00% Other | None Detected               |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                                  |               | Asbestos                    |
|----------------------------------|---------------|----------------------------|-----------------------------------------------------------------------------------------------|---------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                                       | Non-Fibrous   |                             |
| Sample ID 24-2<br>062107143-0053 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Capt. Office - Blue Cove Base<br>Homogeneous                      |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Blue                       |                                                                                               | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Blue                       |                                                                                               | 100.00% Other | None Detected               |
| Sample ID 25-1<br>062107143-0054 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Capt. Office - Blue Cove Base Mastic<br>Heterogeneous/Homogeneous |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan/ White                 |                                                                                               | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Tan/ White                 |                                                                                               | 100.00% Other | None Detected               |
| Sample ID 25-2<br>062107143-0055 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Capt. Office - Blue Cove Base Mastic<br>Heterogeneous/Homogeneous |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan/ White                 |                                                                                               | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Tan/ White                 |                                                                                               | 100.00% Other | None Detected               |
| Sample ID 26-1<br>062107143-0056 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - 2' x 2' Ceiling Tile - Small Fissure<br>Heterogeneous/Homogeneous |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                | 11.00% Min. Wool                                                                              | 89.00% Other  | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                                               | 100.00% Other | None Detected               |
| Sample ID 26-2<br>062107143-0057 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - 2' x 2' Ceiling Tile - Small Fissure<br>Heterogeneous/Homogeneous |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                | 8.90% Min. Wool                                                                               | 91.10% Other  | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                                               | 100.00% Other | None Detected               |
| Sample ID 27-1<br>062107143-0058 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - 1' x1' Ceiling Tile - Spline<br>Heterogeneous/Homogeneous         |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                               |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Brown/ White               |                                                                                               | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Brown/ White               |                                                                                               | 100.00% Other | None Detected               |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                          |                                                                    | Asbestos                    |
|----------------------------------|---------------|----------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                               | Non-Fibrous                                                        |                             |
| Sample ID 27-2<br>062107143-0059 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - 1' x1' Ceiling Tile - Spline<br>Heterogeneous/Homogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Brown/ White               |                                                                                       | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Brown/ White               |                                                                                       | 100.00% Other                                                      | None Detected               |
| Sample ID 28-1<br>062107143-0060 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Window Caulk<br>Homogeneous                               |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White                      |                                                                                       | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | White                      |                                                                                       | 100.00% Other                                                      | None Detected               |
| Sample ID 28-2<br>062107143-0061 |               | Description<br>Homogeneity | Office Add-On - Orig. Bay - Window Caulk<br>Homogeneous                               |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White                      |                                                                                       | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | White                      |                                                                                       | 100.00% Other                                                      | None Detected               |
| Sample ID 29-1<br>062107143-0062 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Gypsum Board<br>Heterogeneous                          |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Brown/ Gray                | 3.00% Cellulose                                                                       | 8.00% Ca Carbonate<br>78.00% Gypsum<br>11.00% Non-fibrous (other)  | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| Sample ID 29-2<br>062107143-0063 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Gypsum Board<br>Heterogeneous                          |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Brown/ Gray                | 3.00% Cellulose                                                                       | 17.00% Ca Carbonate<br>65.00% Gypsum<br>15.00% Non-fibrous (other) | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| Sample ID 30-1<br>062107143-0064 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Joint Compound<br>Heterogeneous                        |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Tan                        | None                                                                                  | 89.00% Ca Carbonate<br>4.00% Mica<br>5.50% Non-fibrous (other)     | 1.50% Chrysotile            |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                  |                                                                   | Asbestos                     |
|----------------------------------|---------------|----------------------------|-----------------------------------------------|-------------------------------------------------------------------|------------------------------|
|                                  |               |                            | Fibrous                                       | Non-Fibrous                                                       |                              |
| Sample ID 30-2<br>062107143-0065 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Joint Compound |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |                            |                                               |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| Sample ID 30-3<br>062107143-0066 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Joint Compound |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |                            |                                               |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| Sample ID 30-4<br>062107143-0067 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Joint Compound |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |                            |                                               |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| Sample ID 30-5<br>062107143-0068 |               | Description<br>Homogeneity | Original Bldg. - Bay - Ceiling Joint Compound |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |                            |                                               |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| Sample ID 31-1<br>062107143-0069 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Gypsum Board      |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Brown/ Gray                | 4.00% Cellulose<br><1.00% Glass               | 9.00% Ca Carbonate<br>81.00% Gypsum<br>6.00% Non-fibrous (other)  | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| Sample ID 31-2<br>062107143-0070 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Gypsum Board      |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Brown/ Gray                | 2.00% Cellulose<br><1.00% Glass               | 11.00% Ca Carbonate<br>79.00% Gypsum<br>8.00% Non-fibrous (other) | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                               |                                                                   | Not Analyzed                 |

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# EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514  
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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                |                                                                | Asbestos      |
|----------------------------------|---------------|----------------------------|-------------------------------------------------------------|----------------------------------------------------------------|---------------|
|                                  |               |                            | Fibrous                                                     | Non-Fibrous                                                    |               |
| Sample ID 32-1<br>062107143-0071 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Joint Compound<br>Heterogeneous |                                                                |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White                      |                                                             | 88.00% Ca Carbonate<br>4.00% Mica<br>8.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |                            |                                                             |                                                                | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| Sample ID 32-2<br>062107143-0072 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Joint Compound<br>Heterogeneous |                                                                |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White                      |                                                             | 90.00% Ca Carbonate<br>4.00% Mica<br>6.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |                            |                                                             |                                                                | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| Sample ID 32-3<br>062107143-0073 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Joint Compound<br>Heterogeneous |                                                                |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White                      |                                                             | 90.00% Ca Carbonate<br>5.00% Mica<br>5.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |                            |                                                             |                                                                | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| Sample ID 32-4<br>062107143-0074 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Joint Compound<br>Heterogeneous |                                                                |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White                      |                                                             | 88.00% Ca Carbonate<br>4.00% Mica<br>8.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |                            |                                                             |                                                                | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| Sample ID 32-5<br>062107143-0075 |               | Description<br>Homogeneity | Original Bldg. - Bay - Wall Joint Compound<br>Heterogeneous |                                                                |               |
| PLM NYS 198.1 Friable            | 04/24/2021    | White                      |                                                             | 91.00% Ca Carbonate<br>5.00% Mica<br>4.00% Non-fibrous (other) | None Detected |
| PLM NYS 198.6 VCM                |               |                            |                                                             |                                                                | Not Analyzed  |
| PLM NYS 198.6 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |
| TEM NYS 198.4 NOB                |               |                            |                                                             |                                                                | Not Analyzed  |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color | Non-Asbestos                                                                                                             |                                                                   | Asbestos                     |
|----------------------------------|---------------|-------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------|
|                                  |               |       | Fibrous                                                                                                                  | Non-Fibrous                                                       |                              |
| Sample ID 33-1<br>062107143-0076 |               |       | Description<br>Original Bldg. - Waiting Area - Ceiling Gypsum Board above Ceiling Tile<br>Homogeneity<br>Heterogeneous   |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray  | <1.00% Cellulose<br><1.00% Glass                                                                                         | 11.00% Ca Carbonate<br>80.00% Gypsum<br>9.00% Non-fibrous (other) | None Detected                |
| PLM NYS 198.6 VCM                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| Sample ID 33-2<br>062107143-0077 |               |       | Description<br>Original Bldg. - Waiting Area - Ceiling Gypsum Board above Ceiling Tile<br>Homogeneity<br>Heterogeneous   |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray  | <1.00% Cellulose<br><1.00% Glass                                                                                         | 13.00% Ca Carbonate<br>78.00% Gypsum<br>9.00% Non-fibrous (other) | None Detected                |
| PLM NYS 198.6 VCM                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| Sample ID 34-1<br>062107143-0078 |               |       | Description<br>Original Bldg. - Waiting Area - Ceiling Joint Compound above Ceiling Tile<br>Homogeneity<br>Heterogeneous |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | White | None                                                                                                                     | 89.00% Ca Carbonate<br>3.00% Mica<br>5.50% Non-fibrous (other)    | 2.50% Chrysotile             |
| PLM NYS 198.6 VCM                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| Sample ID 34-2<br>062107143-0079 |               |       | Description<br>Original Bldg. - Waiting Area - Ceiling Joint Compound above Ceiling Tile<br>Homogeneity                  |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |       |                                                                                                                          |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| Sample ID 34-3<br>062107143-0080 |               |       | Description<br>Original Bldg. - Waiting Area - Ceiling Joint Compound above Ceiling Tile<br>Homogeneity                  |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |       |                                                                                                                          |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| Sample ID 34-4<br>062107143-0081 |               |       | Description<br>Original Bldg. - Waiting Area - Ceiling Joint Compound above Ceiling Tile<br>Homogeneity                  |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |       |                                                                                                                          |                                                                   | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |       |                                                                                                                          |                                                                   | Not Analyzed                 |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                              |                                                                    | Asbestos                     |
|----------------------------------|---------------|----------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------|
|                                  |               |                            | Fibrous                                                                   | Non-Fibrous                                                        |                              |
| Sample ID 34-5<br>062107143-0082 |               | Description<br>Homogeneity | Original Bldg. - Waiting Area - Ceiling Joint Compound above Ceiling Tile |                                                                    |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    |                            |                                                                           |                                                                    | Positive Stop (Not Analyzed) |
| PLM NYS 198.6 VCM                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| Sample ID 35-1<br>062107143-0083 |               | Description<br>Homogeneity | Original Bldg. - Waiting Area - 2' x 2' Ceiling Tile - Pinhole            |                                                                    |                              |
| PLM NYS 198.1 Friable            |               |                            | Heterogeneous/Homogeneous                                                 |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                | 2.10% Min. Wool                                                           | 97.90% Other                                                       | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                           | 100.00% Other                                                      | None Detected                |
| Sample ID 35-2<br>062107143-0084 |               | Description<br>Homogeneity | Original Bldg. - Waiting Area - 2' x 2' Ceiling Tile - Pinhole            |                                                                    |                              |
| PLM NYS 198.1 Friable            |               |                            | Heterogeneous/Homogeneous                                                 |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                | 2.00% Min. Wool                                                           | 98.00% Other                                                       | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                           | 100.00% Other                                                      | None Detected                |
| Sample ID 36-1<br>062107143-0085 |               | Description<br>Homogeneity | Original Bldg. - Bay - CMU                                                |                                                                    |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray/ Black                |                                                                           | 25.00% Ca Carbonate<br>17.00% Non-fibrous (other)<br>58.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| Sample ID 36-2<br>062107143-0086 |               | Description<br>Homogeneity | Original Bldg. - Bay - CMU                                                |                                                                    |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray/ Black                |                                                                           | 28.00% Ca Carbonate<br>12.00% Non-fibrous (other)<br>60.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| Sample ID 37-1<br>062107143-0087 |               | Description<br>Homogeneity | Original Bldg. - Bay - CMU Mortar                                         |                                                                    |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       | None                                                                      | 35.00% Ca Carbonate<br>19.25% Non-fibrous (other)<br>45.00% Quartz | 0.75% Chrysotile             |
| PLM NYS 198.6 VCM                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                                           |                                                                    | Not Analyzed                 |

Inseparable joint compound, analyzed as composite.

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                                               | Analyzed Date | Color              | Non-Asbestos                                 |                                                                    | Asbestos                    |
|----------------------------------------------------|---------------|--------------------|----------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                                    |               |                    | Fibrous                                      | Non-Fibrous                                                        |                             |
| <b>Sample ID</b> 37-2<br>062107143-0088            |               | <b>Description</b> | Original Bldg. - Bay - CMU Mortar            |                                                                    |                             |
|                                                    |               | <b>Homogeneity</b> | Heterogeneous                                |                                                                    |                             |
| <b>PLM NYS 198.1 Friable</b>                       | 04/24/2021    | Gray/ White        | None                                         | 21.00% Ca Carbonate<br>31.00% Non-fibrous (other)<br>48.00% Quartz | <1% Chrysotile              |
| Inseparable joint compound, analyzed as composite. |               |                    |                                              |                                                                    |                             |
| <b>PLM NYS 198.6 VCM</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 NOB</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>TEM NYS 198.4 NOB</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>Sample ID</b> 38-1<br>062107143-0089            |               | <b>Description</b> | Original Bldg. - Bay - Epoxy Floor           |                                                                    |                             |
|                                                    |               | <b>Homogeneity</b> | Homogeneous                                  |                                                                    |                             |
| <b>PLM NYS 198.1 Friable</b>                       |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 VCM</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 NOB</b>                           | 04/26/2021    | Gray               |                                              | 100.00% Other                                                      | Inconclusive: None Detected |
| <b>TEM NYS 198.4 NOB</b>                           | 04/28/2021    | Gray               |                                              | 100.00% Other                                                      | None Detected               |
| <b>Sample ID</b> 38-2<br>062107143-0090            |               | <b>Description</b> | Original Bldg. - Bay - Epoxy Floor           |                                                                    |                             |
|                                                    |               | <b>Homogeneity</b> | Homogeneous                                  |                                                                    |                             |
| <b>PLM NYS 198.1 Friable</b>                       |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 VCM</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 NOB</b>                           | 04/26/2021    | Gray               |                                              | 100.00% Other                                                      | Inconclusive: None Detected |
| <b>TEM NYS 198.4 NOB</b>                           | 04/28/2021    | Gray               |                                              | 100.00% Other                                                      | None Detected               |
| <b>Sample ID</b> 39-1<br>062107143-0091            |               | <b>Description</b> | Original Bldg. - Bay - Yellow Strip on Floor |                                                                    |                             |
|                                                    |               | <b>Homogeneity</b> | Homogeneous                                  |                                                                    |                             |
| <b>PLM NYS 198.1 Friable</b>                       |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 VCM</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 NOB</b>                           | 04/26/2021    | Yellow             |                                              | 100.00% Other                                                      | Inconclusive: None Detected |
| <b>TEM NYS 198.4 NOB</b>                           | 04/28/2021    | Yellow             |                                              | 100.00% Other                                                      | None Detected               |
| <b>Sample ID</b> 39-2<br>062107143-0092            |               | <b>Description</b> | Original Bldg. - Bay - Yellow Strip on Floor |                                                                    |                             |
|                                                    |               | <b>Homogeneity</b> | Homogeneous                                  |                                                                    |                             |
| <b>PLM NYS 198.1 Friable</b>                       |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 VCM</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 NOB</b>                           | 04/26/2021    | Yellow             |                                              | 100.00% Other                                                      | Inconclusive: None Detected |
| <b>TEM NYS 198.4 NOB</b>                           | 04/28/2021    | Yellow             |                                              | 100.00% Other                                                      | None Detected               |
| <b>Sample ID</b> 40-1<br>062107143-0093            |               | <b>Description</b> | Original Bldg. - Lounge - Brown Cove         |                                                                    |                             |
|                                                    |               | <b>Homogeneity</b> | Heterogeneous/Homogeneous                    |                                                                    |                             |
| <b>PLM NYS 198.1 Friable</b>                       |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 VCM</b>                           |               |                    |                                              |                                                                    | Not Analyzed                |
| <b>PLM NYS 198.6 NOB</b>                           | 04/26/2021    | Brown/ Gray        |                                              | 100.00% Other                                                      | Inconclusive: None Detected |
| <b>TEM NYS 198.4 NOB</b>                           | 04/28/2021    | Brown/ Gray        |                                              | 100.00% Other                                                      | None Detected               |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                                      |               | Asbestos                    |
|----------------------------------|---------------|----------------------------|---------------------------------------------------------------------------------------------------|---------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                                           | Non-Fibrous   |                             |
| Sample ID 40-2<br>062107143-0094 |               | Description<br>Homogeneity | Original Bldg. - Lounge - Brown Cove<br>Heterogeneous/Homogeneous                                 |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Brown/ Gray                |                                                                                                   | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Brown/ Gray                |                                                                                                   | 100.00% Other | None Detected               |
| Sample ID 41-1<br>062107143-0095 |               | Description<br>Homogeneity | Original Bldg. - Lounge - Brown Cove Mastic<br>Heterogeneous/Homogeneous                          |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White/ Yellow              |                                                                                                   | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | White/ Yellow              |                                                                                                   | 100.00% Other | None Detected               |
| Sample ID 41-2<br>062107143-0096 |               | Description<br>Homogeneity | Original Bldg. - Lounge - Brown Cove Mastic<br>Heterogeneous/Homogeneous                          |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White/ Yellow              |                                                                                                   | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | White/ Yellow              |                                                                                                   | 100.00% Other | None Detected               |
| Sample ID 42-1<br>062107143-0097 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - 12" x 12" VFT - White w./ Blue Streaks<br>Homogeneous          |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                |                                                                                                   | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                                                   | 100.00% Other | None Detected               |
| Sample ID 42-2<br>062107143-0098 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - 12" x 12" VFT - White w./ Blue Streaks<br>Homogeneous          |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Gray/ White                |                                                                                                   | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Gray/ White                |                                                                                                   | 100.00% Other | None Detected               |
| Sample ID 43-1<br>062107143-0099 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - 12" x 12" VFT - White w./ Blue Streaks - Mastic<br>Homogeneous |               |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |               | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Yellow                     |                                                                                                   | 100.00% Other | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Yellow                     |                                                                                                   | 100.00% Other | None Detected               |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                                      |                                                                    | Asbestos                    |
|----------------------------------|---------------|----------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                                           | Non-Fibrous                                                        |                             |
| Sample ID 43-2<br>062107143-0100 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - 12" x 12" VFT - White w./ Blue Streaks - Mastic<br>Homogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Yellow                     |                                                                                                   | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/28/2021    | Yellow                     |                                                                                                   | 100.00% Other                                                      | None Detected               |
| Sample ID 44-1<br>062107143-0101 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - Ceramic Stone Tile Mortar<br>Heterogeneous                     |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                                                   | 38.00% Ca Carbonate<br>17.00% Non-fibrous (other)<br>45.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| Sample ID 44-2<br>062107143-0102 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - Ceramic Stone Tile Mortar<br>Heterogeneous                     |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                                                   | 38.00% Ca Carbonate<br>12.00% Non-fibrous (other)<br>50.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| Sample ID 45-1<br>062107143-0103 |               | Description<br>Homogeneity | Original Bldg. - Lobby/Lounge - Ceramic Stone Tile Setting Bed<br>Heterogeneous                   |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                                                   | 51.00% Ca Carbonate<br>11.00% Non-fibrous (other)<br>38.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| Sample ID 45-2<br>062107143-0104 |               | Description<br>Homogeneity | Original Bldg. - Office / Lounge - Ceramic Stone Tile Setting Bed<br>Heterogeneous                |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                                                   | 55.00% Ca Carbonate<br>6.00% Non-fibrous (other)<br>39.00% Quartz  | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                                   |                                                                    | Not Analyzed                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color                                    | Non-Asbestos                                                                              |                                                                    | Asbestos                            |
|-----------------------------------------|---------------|------------------------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------|
|                                         |               |                                          | Fibrous                                                                                   | Non-Fibrous                                                        |                                     |
| <b>Sample ID</b> 46-1<br>062107143-0105 |               | <b>Description</b><br><b>Homogeneity</b> | Original Bldg. - Boiler Rm. - Fire Stop Mortar<br>Heterogeneous                           |                                                                    |                                     |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Gray                                     |                                                                                           | 68.00% Ca Carbonate<br>10.00% Non-fibrous (other)<br>22.00% Quartz | <b>None Detected</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 46-2<br>062107143-0106 |               | <b>Description</b><br><b>Homogeneity</b> | Original Bldg. - Boiler Rm. - Fire Stop Mortar<br>Heterogeneous                           |                                                                    |                                     |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Gray                                     |                                                                                           | 58.00% Ca Carbonate<br>14.00% Non-fibrous (other)<br>28.00% Quartz | <b>None Detected</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 47-1<br>062107143-0107 |               | <b>Description</b><br><b>Homogeneity</b> | Original Bldg. - Boiler Rm. - Chimney Flue - Fire Stop Caulk<br>Heterogeneous/Homogeneous |                                                                    |                                     |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Gray/ White                              |                                                                                           | 100.00% Other                                                      | <b>Inconclusive: None Detected</b>  |
| <b>TEM NYS 198.4 NOB</b>                | 04/28/2021    | Gray/ White                              |                                                                                           | 100.00% Other                                                      | <b>None Detected</b>                |
| <b>Sample ID</b> 47-2<br>062107143-0108 |               | <b>Description</b><br><b>Homogeneity</b> | Original Bldg. - Boiler Rm. - Chimney Flue - Fire Stop Caulk<br>Heterogeneous/Homogeneous |                                                                    |                                     |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Gray/ White                              |                                                                                           | 100.00% Other                                                      | <b>Inconclusive: None Detected</b>  |
| <b>TEM NYS 198.4 NOB</b>                | 04/28/2021    | Gray/ White                              |                                                                                           | 100.00% Other                                                      | <b>None Detected</b>                |
| <b>Sample ID</b> 48-1<br>062107143-0109 |               | <b>Description</b><br><b>Homogeneity</b> | Original Bldg. - Boiler Rm. - Transite Ceiling<br>Heterogeneous                           |                                                                    |                                     |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Gray                                     | None                                                                                      | 65.00% Ca Carbonate<br>10.20% Non-fibrous (other)<br>15.00% Quartz | <b>9.80% Chrysotile</b>             |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 48-2<br>062107143-0110 |               | <b>Description</b><br><b>Homogeneity</b> | Original Bldg. - Boiler Rm. - Transite Ceiling                                            |                                                                    |                                     |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    |                                          |                                                                                           |                                                                    | <b>Positive Stop (Not Analyzed)</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                                           |                                                                    | <b>Not Analyzed</b>                 |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                      |               | Asbestos                     |
|----------------------------------|---------------|----------------------------|-------------------------------------------------------------------|---------------|------------------------------|
|                                  |               |                            | Fibrous                                                           | Non-Fibrous   |                              |
| Sample ID 49-1<br>062107143-0111 |               | Description<br>Homogeneity | Original Bldg. - Boiler Rm. - Window Caulk<br>Homogeneous         |               |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | White                      |                                                                   | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/28/2021    | White                      |                                                                   | 100.00% Other | None Detected                |
| Sample ID 49-2<br>062107143-0112 |               | Description<br>Homogeneity | Original Bldg. - Boiler Rm. - Window Caulk<br>Homogeneous         |               |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | White                      |                                                                   | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/28/2021    | White                      |                                                                   | 100.00% Other | None Detected                |
| Sample ID 50-1<br>062107143-0113 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Black Cove Base<br>Homogeneous        |               |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Black                      |                                                                   | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/28/2021    | Black                      |                                                                   | 100.00% Other | None Detected                |
| Sample ID 50-2<br>062107143-0114 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Black Cove Base<br>Homogeneous        |               |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Black                      |                                                                   | 100.00% Other | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/28/2021    | Black                      |                                                                   | 100.00% Other | None Detected                |
| Sample ID 51-1<br>062107143-0115 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Black Cove Base Mastic<br>Homogeneous |               |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Black                      | None                                                              | 96.10% Other  | 3.90% Chrysotile             |
| TEM NYS 198.4 NOB                |               |                            |                                                                   |               | Not Analyzed                 |
| Sample ID 51-2<br>062107143-0116 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Black Cove Base Mastic                |               |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                   |               | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    |                            |                                                                   |               | Positive Stop (Not Analyzed) |
| TEM NYS 198.4 NOB                |               |                            |                                                                   |               | Not Analyzed                 |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                                             | Analyzed Date | Color              | Non-Asbestos                                                          |               | Asbestos                            |
|--------------------------------------------------|---------------|--------------------|-----------------------------------------------------------------------|---------------|-------------------------------------|
|                                                  |               |                    | Fibrous                                                               | Non-Fibrous   |                                     |
| <b>Sample ID</b> 52-1<br>062107143-0117          |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Storage - 12" x 12" VFT - Yellow          |               |                                     |
|                                                  |               | <b>Homogeneity</b> | Homogeneous                                                           |               |                                     |
| <b>PLM NYS 198.1 Friable</b>                     |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b><br>Floor tile is green. | 04/26/2021    | Green              | <1.00% Fibrous (other)                                                | 96.50% Other  | <b>3.50% Chrysotile</b>             |
| <b>TEM NYS 198.4 NOB</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 52-2<br>062107143-0118          |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Storage - 12" x 12" VFT - Yellow          |               |                                     |
|                                                  |               | <b>Homogeneity</b> |                                                                       |               |                                     |
| <b>PLM NYS 198.1 Friable</b>                     |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b><br>Floor Tile is green. | 04/26/2021    |                    |                                                                       |               | <b>Positive Stop (Not Analyzed)</b> |
| <b>TEM NYS 198.4 NOB</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 53-1<br>062107143-0119          |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Storage - 12" x 12" VFT - Yellow - Mastic |               |                                     |
|                                                  |               | <b>Homogeneity</b> | Homogeneous                                                           |               |                                     |
| <b>PLM NYS 198.1 Friable</b>                     |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b><br>Floor Tile is green. | 04/26/2021    | Black              | None                                                                  | 98.90% Other  | <b>1.10% Chrysotile</b>             |
| <b>TEM NYS 198.4 NOB</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 53-2<br>062107143-0120          |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Storage - 12" x 12" VFT - Yellow - Mastic |               |                                     |
|                                                  |               | <b>Homogeneity</b> |                                                                       |               |                                     |
| <b>PLM NYS 198.1 Friable</b>                     |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b><br>Floor Tile is green. | 04/26/2021    |                    |                                                                       |               | <b>Positive Stop (Not Analyzed)</b> |
| <b>TEM NYS 198.4 NOB</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>Sample ID</b> 54-1<br>062107143-0121          |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Carpet Mastic                             |               |                                     |
|                                                  |               | <b>Homogeneity</b> | Homogeneous                                                           |               |                                     |
| <b>PLM NYS 198.1 Friable</b>                     |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b><br>Floor Tile is green. | 04/26/2021    | Yellow             |                                                                       | 100.00% Other | <b>Inconclusive: None Detected</b>  |
| <b>TEM NYS 198.4 NOB</b><br>Floor Tile is green. | 04/28/2021    | Yellow             |                                                                       | 100.00% Other | <b>None Detected</b>                |
| <b>Sample ID</b> 54-2<br>062107143-0122          |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Carpet Mastic                             |               |                                     |
|                                                  |               | <b>Homogeneity</b> | Homogeneous                                                           |               |                                     |
| <b>PLM NYS 198.1 Friable</b>                     |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 VCM</b>                         |               |                    |                                                                       |               | <b>Not Analyzed</b>                 |
| <b>PLM NYS 198.6 NOB</b><br>Floor Tile is green. | 04/26/2021    | Yellow             |                                                                       | 100.00% Other | <b>Inconclusive: None Detected</b>  |
| <b>TEM NYS 198.4 NOB</b><br>Floor Tile is green. | 04/28/2021    | Yellow             |                                                                       | 100.00% Other | <b>None Detected</b>                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                   |                                                                    | Asbestos         |
|----------------------------------|---------------|----------------------------|----------------------------------------------------------------|--------------------------------------------------------------------|------------------|
|                                  |               |                            | Fibrous                                                        | Non-Fibrous                                                        |                  |
| Sample ID 55-1<br>062107143-0123 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Stucco over Brick<br>Heterogeneous |                                                                    |                  |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                | 38.00% Ca Carbonate<br>22.00% Non-fibrous (other)<br>40.00% Quartz | None Detected    |
| PLM NYS 198.6 VCM                |               |                            |                                                                |                                                                    | Not Analyzed     |
| PLM NYS 198.6 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| TEM NYS 198.4 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| Sample ID 55-2<br>062107143-0124 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Stucco over Brick<br>Heterogeneous |                                                                    |                  |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                | 51.00% Ca Carbonate<br>19.00% Non-fibrous (other)<br>30.00% Quartz | None Detected    |
| PLM NYS 198.6 VCM                |               |                            |                                                                |                                                                    | Not Analyzed     |
| PLM NYS 198.6 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| TEM NYS 198.4 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| Sample ID 55-3<br>062107143-0125 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Stucco over Brick<br>Heterogeneous |                                                                    |                  |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       | None                                                           | 58.00% Ca Carbonate<br>6.50% Non-fibrous (other)<br>35.00% Quartz  | 0.50% Chrysotile |
| PLM NYS 198.6 VCM                |               |                            |                                                                |                                                                    | Not Analyzed     |
| PLM NYS 198.6 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| TEM NYS 198.4 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| Sample ID 56-1<br>062107143-0126 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Brick<br>Heterogeneous             |                                                                    |                  |
| PLM NYS 198.1 Friable            | 04/24/2021    | Red                        |                                                                | 29.00% Non-fibrous (other)<br>71.00% Quartz                        | None Detected    |
| PLM NYS 198.6 VCM                |               |                            |                                                                |                                                                    | Not Analyzed     |
| PLM NYS 198.6 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| TEM NYS 198.4 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| Sample ID 56-2<br>062107143-0127 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Brick<br>Heterogeneous             |                                                                    |                  |
| PLM NYS 198.1 Friable            | 04/24/2021    | Red                        |                                                                | 32.00% Non-fibrous (other)<br>68.00% Quartz                        | None Detected    |
| PLM NYS 198.6 VCM                |               |                            |                                                                |                                                                    | Not Analyzed     |
| PLM NYS 198.6 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |
| TEM NYS 198.4 NOB                |               |                            |                                                                |                                                                    | Not Analyzed     |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                           |                                                                    | Asbestos                     |
|----------------------------------|---------------|----------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------|
|                                  |               |                            | Fibrous                                                                                | Non-Fibrous                                                        |                              |
| Sample ID 57-1<br>062107143-0128 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Brick Mortar<br>Heterogeneous                              |                                                                    |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                                        | 25.00% Ca Carbonate<br>15.00% Non-fibrous (other)<br>60.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| Sample ID 57-2<br>062107143-0129 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Brick Mortar<br>Heterogeneous                              |                                                                    |                              |
| PLM NYS 198.1 Friable            | 04/24/2021    | Gray                       |                                                                                        | 21.00% Ca Carbonate<br>9.00% Non-fibrous (other)<br>70.00% Quartz  | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| Sample ID 58-1<br>062107143-0130 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Behind Bar - Green Epoxy<br>Homogeneous                    |                                                                    |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Green                      |                                                                                        | 100.00% Other                                                      | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/29/2021    | Green                      |                                                                                        | 100.00% Other                                                      | None Detected                |
| Sample ID 58-2<br>062107143-0131 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Behind Bar - Green Epoxy<br>Homogeneous                    |                                                                    |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Green                      |                                                                                        | 100.00% Other                                                      | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/29/2021    | Green                      |                                                                                        | 100.00% Other                                                      | None Detected                |
| Sample ID 59-1<br>062107143-0132 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Ice Machine - Floor Tile Mastic under Epoxy<br>Homogeneous |                                                                    |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Black                      | None                                                                                   | 94.80% Other                                                       | 5.20% Chrysotile             |
| TEM NYS 198.4 NOB                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| Sample ID 59-2<br>062107143-0133 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Bar - Ice Machine - Floor Tile Mastic under Epoxy<br>Homogeneous |                                                                    |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    |                            |                                                                                        |                                                                    | Positive Stop (Not Analyzed) |
| TEM NYS 198.4 NOB                |               |                            |                                                                                        |                                                                    | Not Analyzed                 |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color              | Non-Asbestos                                                      |                                                                   | Asbestos             |
|-----------------------------------------|---------------|--------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|----------------------|
|                                         |               |                    | Fibrous                                                           | Non-Fibrous                                                       |                      |
| <b>Sample ID</b> 60-1<br>062107143-0134 |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Bathroom - Wall Fiber Board           |                                                                   |                      |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                     |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Brown/ White       | 90.00% Cellulose                                                  | 10.00% Non-fibrous (other)                                        | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 60-2<br>062107143-0135 |               | <b>Description</b> | New Bldg. - 1st Fl. - Bar - Bathroom - Wall Fiber Board           |                                                                   |                      |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                     |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Brown/ White       | 90.00% Cellulose                                                  | 10.00% Non-fibrous (other)                                        | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 61-1<br>062107143-0136 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Gypsum Board (Soffit) |                                                                   |                      |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                     |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Brown/ Gray        | 2.00% Cellulose<br><1.00% Glass                                   | 10.00% Ca Carbonate<br>80.00% Gypsum<br>8.00% Non-fibrous (other) | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 61-2<br>062107143-0137 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Gypsum Board (Soffit) |                                                                   |                      |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                     |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Brown/ Gray        | 2.00% Cellulose<br><1.00% Glass                                   | 14.00% Ca Carbonate<br>75.00% Gypsum<br>9.00% Non-fibrous (other) | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 62-1<br>062107143-0138 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Joint Compound        |                                                                   |                      |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                     |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White              |                                                                   | 90.00% Ca Carbonate<br>4.00% Mica<br>6.00% Non-fibrous (other)    | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 62-2<br>062107143-0139 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Joint Compound        |                                                                   |                      |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                     |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White              |                                                                   | 90.00% Ca Carbonate<br>4.00% Mica<br>6.00% Non-fibrous (other)    | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                   |                                                                   | <b>Not Analyzed</b>  |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color                                    | Non-Asbestos                                                                |                                                                   | Asbestos             |
|-----------------------------------------|---------------|------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------|
|                                         |               |                                          | Fibrous                                                                     | Non-Fibrous                                                       |                      |
| <b>Sample ID</b> 62-3<br>062107143-0140 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Joint Compound<br>Heterogeneous |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White                                    |                                                                             | 88.00% Ca Carbonate<br>6.00% Mica<br>6.00% Non-fibrous (other)    | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 62-4<br>062107143-0141 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Joint Compound<br>Heterogeneous |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White                                    |                                                                             | 88.00% Ca Carbonate<br>4.00% Mica<br>8.00% Non-fibrous (other)    | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 62-5<br>062107143-0142 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Ceiling Joint Compound<br>Heterogeneous |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | White                                    |                                                                             | 90.00% Ca Carbonate<br>3.00% Mica<br>7.00% Non-fibrous (other)    | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 63-1<br>062107143-0143 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Gypsum Board<br>Heterogeneous      |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Brown/ Gray                              | 3.00% Cellulose                                                             | 11.00% Ca Carbonate<br>80.00% Gypsum<br>6.00% Non-fibrous (other) | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 63-2<br>062107143-0144 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Gypsum Board<br>Heterogeneous      |                                                                   |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/24/2021    | Brown/ Gray                              | 3.00% Cellulose                                                             | 13.00% Ca Carbonate<br>78.00% Gypsum<br>6.00% Non-fibrous (other) | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                             |                                                                   | <b>Not Analyzed</b>  |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                                                         | Analyzed Date | Color                                    | Non-Asbestos                                                             |                                                                | Asbestos                |
|--------------------------------------------------------------|---------------|------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------|
|                                                              |               |                                          | Fibrous                                                                  | Non-Fibrous                                                    |                         |
| <b>Sample ID</b> 64-1<br>062107143-0145                      |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Heterogeneous |                                                                |                         |
| <b>PLM NYS 198.1 Friable</b>                                 | 04/24/2021    | Tan/ White                               | None                                                                     | 89.00% Ca Carbonate<br>4.00% Mica<br>6.25% Non-fibrous (other) | <b>0.75% Chrysotile</b> |
| Tan and white joint compound present. Analyzed as composite. |               |                                          |                                                                          |                                                                |                         |
| <b>PLM NYS 198.6 VCM</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>PLM NYS 198.6 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>TEM NYS 198.4 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>Sample ID</b> 64-2<br>062107143-0146                      |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Heterogeneous |                                                                |                         |
| <b>PLM NYS 198.1 Friable</b>                                 | 04/28/2021    | Tan/ White                               | None                                                                     | 88.00% Ca Carbonate<br>4.00% Mica<br>7.25% Non-fibrous (other) | <b>0.75% Chrysotile</b> |
| Tan and white joint compound present. Analyzed as composite, |               |                                          |                                                                          |                                                                |                         |
| <b>PLM NYS 198.6 VCM</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>PLM NYS 198.6 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>TEM NYS 198.4 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>Sample ID</b> 64-3<br>062107143-0147                      |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Heterogeneous |                                                                |                         |
| <b>PLM NYS 198.1 Friable</b>                                 | 04/24/2021    | White                                    |                                                                          | 91.00% Ca Carbonate<br>4.00% Mica<br>5.00% Non-fibrous (other) | <b>None Detected</b>    |
| <b>PLM NYS 198.6 VCM</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>PLM NYS 198.6 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>TEM NYS 198.4 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>Sample ID</b> 64-4<br>062107143-0148                      |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Heterogeneous |                                                                |                         |
| <b>PLM NYS 198.1 Friable</b>                                 | 04/24/2021    | White                                    |                                                                          | 88.00% Ca Carbonate<br>7.00% Mica<br>5.00% Non-fibrous (other) | <b>None Detected</b>    |
| <b>PLM NYS 198.6 VCM</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>PLM NYS 198.6 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>TEM NYS 198.4 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>Sample ID</b> 64-5<br>062107143-0149                      |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Heterogeneous |                                                                |                         |
| <b>PLM NYS 198.1 Friable</b>                                 | 04/24/2021    | White                                    |                                                                          | 91.00% Ca Carbonate<br>5.00% Mica<br>4.00% Non-fibrous (other) | <b>None Detected</b>    |
| <b>PLM NYS 198.6 VCM</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>PLM NYS 198.6 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |
| <b>TEM NYS 198.4 NOB</b>                                     |               |                                          |                                                                          |                                                                | <b>Not Analyzed</b>     |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color        | Non-Asbestos                                                                                           |                                                                    | Asbestos                    |
|----------------------------------|---------------|--------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                  |               |              | Fibrous                                                                                                | Non-Fibrous                                                        |                             |
| Sample ID 64-6<br>062107143-0150 |               |              | Description<br>New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Homogeneity<br>Heterogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | White        |                                                                                                        | 87.00% Ca Carbonate<br>8.00% Mica<br>5.00% Non-fibrous (other)     | None Detected               |
| PLM NYS 198.6 VCM                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| Sample ID 64-7<br>062107143-0151 |               |              | Description<br>New Bldg. - 1st Fl. - Meeting Rm. - Wall Joint Compound<br>Homogeneity<br>Heterogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/24/2021    | White        |                                                                                                        | 91.00% Ca Carbonate<br>3.00% Mica<br>6.00% Non-fibrous (other)     | None Detected               |
| PLM NYS 198.6 VCM                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| Sample ID 65-1<br>062107143-0152 |               |              | Description<br>New Bldg. - 1st Fl. - Girls Bath - Wall Tile Grout<br>Homogeneity<br>Heterogeneous      |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Brown/ White | <1.00% Cellulose<br>4.00% Glass                                                                        | 45.00% Ca Carbonate<br>43.00% Non-fibrous (other)<br>8.00% Quartz  | None Detected               |
| PLM NYS 198.6 VCM                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| Sample ID 65-2<br>062107143-0153 |               |              | Description<br>New Bldg. - 1st Fl. - Girls Bath - Wall Tile Grout<br>Homogeneity<br>Homogeneous        |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Brown        | 2.00% Cellulose                                                                                        | 50.00% Ca Carbonate<br>38.00% Non-fibrous (other)<br>10.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| Sample ID 66-1<br>062107143-0154 |               |              | Description<br>New Bldg. - 1st Fl. - Girls Bath - Wall Tile Glue<br>Homogeneity<br>Homogeneous         |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White        | <1.00% Glass                                                                                           | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | White        |                                                                                                        | 100.00% Other                                                      | None Detected               |
| Sample ID 66-2<br>062107143-0155 |               |              | Description<br>New Bldg. - 1st Fl. - Girls Bath - Wall Tile Glue<br>Homogeneity<br>Homogeneous         |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |              |                                                                                                        |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White        | 1.30% Glass                                                                                            | 98.70% Other                                                       | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | White        |                                                                                                        | 100.00% Other                                                      | None Detected               |

Initial report from: 04/28/2021 03:52:10



# EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color       | Non-Asbestos                                                                                     |                                                                    | Asbestos                    |
|----------------------------------|---------------|-------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                  |               |             | Fibrous                                                                                          | Non-Fibrous                                                        |                             |
| Sample ID 67-1<br>062107143-0156 |               |             | Description New Bldg. - 1st Fl. - Girls Bath - Floor Tile Grout<br>Homogeneity Heterogeneous     |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Brown/ Gray | 2.00% Cellulose                                                                                  | 30.00% Ca Carbonate<br>13.00% Non-fibrous (other)<br>55.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| Sample ID 67-2<br>062107143-0157 |               |             | Description New Bldg. - 1st Fl. - Girls Bath - Floor Tile Grout<br>Homogeneity Heterogeneous     |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Brown/ Gray | 3.00% Cellulose                                                                                  | 25.00% Ca Carbonate<br>12.00% Non-fibrous (other)<br>60.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| Sample ID 68-1<br>062107143-0158 |               |             | Description New Bldg. - 1st Fl. - Girls Bath - Floor Tile Glue Dots<br>Homogeneity Homogeneous   |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan         |                                                                                                  | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | Tan         |                                                                                                  | 100.00% Other                                                      | None Detected               |
| Sample ID 68-2<br>062107143-0159 |               |             | Description New Bldg. - 1st Fl. - Girls Bath - Floor Tile Glue Dots<br>Homogeneity Homogeneous   |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan         |                                                                                                  | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | Tan         |                                                                                                  | 100.00% Other                                                      | None Detected               |
| Sample ID 69-1<br>062107143-0160 |               |             | Description New Bldg. - 1st Fl. - Girls Bath - Floor Tile Setting Bed<br>Homogeneity Homogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray        |                                                                                                  | 25.00% Ca Carbonate<br>7.00% Non-fibrous (other)<br>68.00% Quartz  | None Detected               |
| PLM NYS 198.6 VCM                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| Sample ID 69-2<br>062107143-0161 |               |             | Description New Bldg. - 1st Fl. - Girls Bath - Floor Tile Setting Bed<br>Homogeneity Homogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray        |                                                                                                  | 25.00% Ca Carbonate<br>10.00% Non-fibrous (other)<br>65.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |             |                                                                                                  |                                                                    | Not Analyzed                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color              | Non-Asbestos                                                             |                                                                  | Asbestos                           |
|-----------------------------------------|---------------|--------------------|--------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------|
|                                         |               |                    | Fibrous                                                                  | Non-Fibrous                                                      |                                    |
| <b>Sample ID</b> 70-1<br>062107143-0162 |               | <b>Description</b> | New Bldg. - 1st Fl. - Girls Bath - Wallboard behind Tiles                |                                                                  |                                    |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                            |                                                                  |                                    |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | Tan/ White         | 7.00% Cellulose<br>15.00% Glass                                          | 8.00% Ca Carbonate<br>65.00% Gypsum<br>5.00% Non-fibrous (other) | <b>None Detected</b>               |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>Sample ID</b> 70-2<br>062107143-0163 |               | <b>Description</b> | New Bldg. - 1st Fl. - Girls Bath - Wallboard behind Tiles                |                                                                  |                                    |
|                                         |               | <b>Homogeneity</b> | Heterogeneous                                                            |                                                                  |                                    |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | Tan/ White         | 5.00% Cellulose<br>17.00% Glass                                          | 8.00% Ca Carbonate<br>70.00% Gypsum                              | <b>None Detected</b>               |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>TEM NYS 198.4 NOB</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>Sample ID</b> 71-1<br>062107143-0164 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - 12" x 12" VFT - Blue (Top)           |                                                                  |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                              |                                                                  |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Blue               |                                                                          | 100.00% Other                                                    | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | Blue               |                                                                          | 100.00% Other                                                    | <b>None Detected</b>               |
| <b>Sample ID</b> 71-2<br>062107143-0165 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - 12" x 12" VFT - Blue ((Top)          |                                                                  |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                              |                                                                  |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Blue               |                                                                          | 100.00% Other                                                    | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | Blue               |                                                                          | 100.00% Other                                                    | <b>None Detected</b>               |
| <b>Sample ID</b> 72-1<br>062107143-0166 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - 12" x 12" VFT - Blue ((Top) - Mastic |                                                                  |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                              |                                                                  |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Brown              |                                                                          | 100.00% Other                                                    | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | Brown              |                                                                          | 100.00% Other                                                    | <b>None Detected</b>               |
| <b>Sample ID</b> 72-2<br>062107143-0167 |               | <b>Description</b> | New Bldg. - 1st Fl. - Meeting Rm. - 12" x 12" VFT - Blue ((Top) - Mastic |                                                                  |                                    |
|                                         |               | <b>Homogeneity</b> | Homogeneous                                                              |                                                                  |                                    |
| <b>PLM NYS 198.1 Friable</b>            |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 VCM</b>                |               |                    |                                                                          |                                                                  | <b>Not Analyzed</b>                |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Brown              |                                                                          | 100.00% Other                                                    | <b>Inconclusive: None Detected</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | Brown              |                                                                          | 100.00% Other                                                    | <b>None Detected</b>               |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color                                    | Non-Asbestos                                                                           |               | Asbestos                                |
|-----------------------------------------|---------------|------------------------------------------|----------------------------------------------------------------------------------------|---------------|-----------------------------------------|
|                                         |               |                                          | Fibrous                                                                                | Non-Fibrous   |                                         |
| <b>Sample ID</b> 73-1<br>062107143-0168 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - 12" x 12" VFT - White (Top)<br>Homogeneous         |               |                                         |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | White/ Blue                              |                                                                                        | 100.00% Other | <b>Inconclusive: None Detected</b>      |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | White/ Blue                              |                                                                                        | 100.00% Other | <b>None Detected</b>                    |
| <b>Sample ID</b> 73-2<br>062107143-0169 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - 12" x 12" VFT - White (Top)<br>Homogeneous         |               |                                         |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | White/ Blue                              |                                                                                        | 100.00% Other | <b>Inconclusive: None Detected</b>      |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | White/ Blue                              |                                                                                        | 100.00% Other | <b>None Detected</b>                    |
| <b>Sample ID</b> 74-1<br>062107143-0170 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - VFT (Bottom)<br>Homogeneous                        |               |                                         |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Brown/ Gray/<br>Tan                      | None                                                                                   | 98.70% Other  | <b>1.30% Chrysotile</b>                 |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>Sample ID</b> 74-2<br>062107143-0171 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - VFT (Bottom)<br>Homogeneous                        |               |                                         |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    |                                          |                                                                                        |               | <b>Positive Stop (Not Analyzed)</b>     |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>Sample ID</b> 75-1<br>062107143-0172 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - VFT (Bottom) - Mastic<br>Heterogeneous/Homogeneous |               |                                         |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Brown/ Black                             | None                                                                                   | 100.00% Other | <b>Inconclusive : &lt;1% Chrysotile</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    | Brown/ Black                             | None                                                                                   | 98.00% Other  | <b>2.00% Chrysotile</b>                 |
| <b>Sample ID</b> 75-2<br>062107143-0173 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - 1st Fl. - Meeting Rm. - VFT (Bottom) - Mastic<br>Heterogeneous             |               |                                         |
| <b>PLM NYS 198.1 Friable</b>            |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                                        |               | <b>Not Analyzed</b>                     |
| <b>PLM NYS 198.6 NOB</b>                | 04/26/2021    | Brown/ Black                             | None                                                                                   | 100.00% Other | <b>Inconclusive : &lt;1% Chrysotile</b> |
| <b>TEM NYS 198.4 NOB</b>                | 04/29/2021    |                                          |                                                                                        |               | <b>Positive Stop (Not Analyzed)</b>     |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color | Non-Asbestos                                                                               |                                                                    | Asbestos                    |
|----------------------------------|---------------|-------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                  |               |       | Fibrous                                                                                    | Non-Fibrous                                                        |                             |
| Sample ID 76-1<br>062107143-0174 |               |       | Description New Bldg. - 1st Fl. - Men's Bath - Wall Tile Grout<br>Homogeneity Homogeneous  |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray  | <1.00% Cellulose                                                                           | 45.00% Ca Carbonate<br>40.00% Non-fibrous (other)<br>15.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| Sample ID 76-2<br>062107143-0175 |               |       | Description New Bldg. - 1st Fl. - Men's Bath - Wall Tile Grout<br>Homogeneity Homogeneous  |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray  |                                                                                            | 50.00% Ca Carbonate<br>38.00% Non-fibrous (other)<br>12.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| Sample ID 77-1<br>062107143-0176 |               |       | Description New Bldg. - 1st Fl. - Men's Bath - Wall Tile Glue<br>Homogeneity Homogeneous   |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White | 4.00% Glass                                                                                | 96.00% Other                                                       | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | White |                                                                                            | 100.00% Other                                                      | None Detected               |
| Sample ID 77-2<br>062107143-0177 |               |       | Description New Bldg. - 1st Fl. - Men's Bath - Wall Tile Glue<br>Homogeneity Homogeneous   |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | White | 4.10% Glass                                                                                | 95.90% Other                                                       | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | White |                                                                                            | 100.00% Other                                                      | None Detected               |
| Sample ID 78-1<br>062107143-0178 |               |       | Description New Bldg. - 1st Fl. - Men's Bath - Floor Tile Grout<br>Homogeneity Homogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray  | 2.00% Cellulose                                                                            | 35.00% Ca Carbonate<br>18.00% Non-fibrous (other)<br>45.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| Sample ID 78-2<br>062107143-0179 |               |       | Description New Bldg. - 1st Fl. - Men's Bath - Floor Tile Grout<br>Homogeneity Homogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray  | <1.00% Cellulose                                                                           | 40.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>55.00% Quartz  | None Detected               |
| PLM NYS 198.6 VCM                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |       |                                                                                            |                                                                    | Not Analyzed                |

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EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                                          |                                                                    | Asbestos                    |
|----------------------------------|---------------|----------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|
|                                  |               |                            | Fibrous                                                                               | Non-Fibrous                                                        |                             |
| Sample ID 79-1<br>062107143-0180 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Men's Bath - Floor Tile Glue Dot<br>Homogeneous                 |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan                        |                                                                                       | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | Tan                        |                                                                                       | 100.00% Other                                                      | None Detected               |
| Sample ID 79-2<br>062107143-0181 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Men's Bath - Floor Tile Glue Dot<br>Homogeneous                 |                                                                    |                             |
| PLM NYS 198.1 Friable            |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                | 04/26/2021    | Tan                        |                                                                                       | 100.00% Other                                                      | Inconclusive: None Detected |
| TEM NYS 198.4 NOB                | 04/29/2021    | Tan                        |                                                                                       | 100.00% Other                                                      | None Detected               |
| Sample ID 80-1<br>062107143-0182 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Men's Bath - Floor Tile Setting Bed<br>Homogeneous              |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray                       |                                                                                       | 30.00% Ca Carbonate<br>10.00% Non-fibrous (other)<br>60.00% Quartz | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| Sample ID 80-2<br>062107143-0183 |               | Description<br>Homogeneity | New Bldg. - 1st Fl. - Men's Bath - Floor Tile Setting Bed<br>Homogeneous              |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray                       |                                                                                       | 30.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>65.00% Quartz  | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| Sample ID 81-1<br>062107143-0184 |               | Description<br>Homogeneity | New Bldg. - Kitchen & Bath - Ceiling Gypsum Board above Drop Ceiling<br>Heterogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Brown/ Gray                | 10.00% Cellulose<br>7.00% Glass                                                       | 8.00% Ca Carbonate<br>70.00% Gypsum<br>5.00% Non-fibrous (other)   | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| Sample ID 81-2<br>062107143-0185 |               | Description<br>Homogeneity | New Bldg. - Kitchen & Bath - Ceiling Gypsum Board above Drop Ceiling<br>Heterogeneous |                                                                    |                             |
| PLM NYS 198.1 Friable            | 04/26/2021    | Brown/ Gray                | 12.00% Cellulose<br>8.00% Glass                                                       | 8.00% Ca Carbonate<br>72.00% Gypsum                                | None Detected               |
| PLM NYS 198.6 VCM                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| PLM NYS 198.6 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |
| TEM NYS 198.4 NOB                |               |                            |                                                                                       |                                                                    | Not Analyzed                |

Initial report from: 04/28/2021 03:52:10



# EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514  
 Tel/Fax: (516) 997-7251 / (516) 997-7528  
<http://www.EMSL.com> / [carleplacelab@emsl.com](mailto:carleplacelab@emsl.com)

EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

| Test                                    | Analyzed Date | Color                                    | Non-Asbestos                                                         |                                                                    | Asbestos             |
|-----------------------------------------|---------------|------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------|----------------------|
|                                         |               |                                          | Fibrous                                                              | Non-Fibrous                                                        |                      |
| <b>Sample ID</b> 82-1<br>062107143-0186 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - Kitchen & Bath - Ceiling Joint Compound<br>Heterogeneous |                                                                    |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | White                                    |                                                                      | 60.00% Ca Carbonate<br>8.00% Mica<br>32.00% Non-fibrous (other)    | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 82-2<br>062107143-0187 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - Kitchen & Bath - Ceiling Joint Compound<br>Heterogeneous |                                                                    |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | White                                    |                                                                      | 70.00% Ca Carbonate<br>10.00% Mica<br>20.00% Non-fibrous (other)   | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 82-3<br>062107143-0188 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - Kitchen & Bath - Ceiling Joint Compound<br>Heterogeneous |                                                                    |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | White                                    |                                                                      | 68.00% Ca Carbonate<br>10.00% Mica<br>22.00% Non-fibrous (other)   | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 83-1<br>062107143-0189 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - Kitchen - Floor Tile Grout<br>Homogeneous                |                                                                    |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | Brown/ Gray                              |                                                                      | 25.00% Ca Carbonate<br>15.00% Non-fibrous (other)<br>60.00% Quartz | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>Sample ID</b> 83-2<br>062107143-0190 |               | <b>Description</b><br><b>Homogeneity</b> | New Bldg. - Kitchen - Floor Tile Grout<br>Homogeneous                |                                                                    |                      |
| <b>PLM NYS 198.1 Friable</b>            | 04/26/2021    | Brown/ Gray                              |                                                                      | 25.00% Ca Carbonate<br>10.00% Non-fibrous (other)<br>65.00% Quartz | <b>None Detected</b> |
| <b>PLM NYS 198.6 VCM</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>PLM NYS 198.6 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |
| <b>TEM NYS 198.4 NOB</b>                |               |                                          |                                                                      |                                                                    | <b>Not Analyzed</b>  |

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<http://www.EMSL.com> / [carleplacelab@emsl.com](mailto:carleplacelab@emsl.com)

EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

## Test Report: Asbestos Analysis of Bulk Material

| Test                             | Analyzed Date | Color                      | Non-Asbestos                                                  |                                                                   | Asbestos                     |
|----------------------------------|---------------|----------------------------|---------------------------------------------------------------|-------------------------------------------------------------------|------------------------------|
|                                  |               |                            | Fibrous                                                       | Non-Fibrous                                                       |                              |
| Sample ID 84-1<br>062107143-0191 |               | Description<br>Homogeneity | New Bldg. - Kitchen - Floor Tile Mud<br>Heterogeneous         |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray                       |                                                               | 30.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>65.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| Sample ID 84-2<br>062107143-0192 |               | Description<br>Homogeneity | New Bldg. - Kitchen - Floor Tile Mud<br>Heterogeneous         |                                                                   |                              |
| PLM NYS 198.1 Friable            | 04/26/2021    | Gray                       |                                                               | 35.00% Ca Carbonate<br>5.00% Non-fibrous (other)<br>60.00% Quartz | None Detected                |
| PLM NYS 198.6 VCM                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| TEM NYS 198.4 NOB                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| Sample ID 85-1<br>062107143-0193 |               | Description<br>Homogeneity | 2nd Fl. - Comm. Office - Carpet Mastic<br>Homogeneous         |                                                                   |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Yellow                     |                                                               | 100.00% Other                                                     | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/29/2021    | Yellow                     |                                                               | 100.00% Other                                                     | None Detected                |
| Sample ID 85-2<br>062107143-0194 |               | Description<br>Homogeneity | 2nd Fl. - Chief Office - Carpet Mastic<br>Homogeneous         |                                                                   |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Yellow                     |                                                               | 100.00% Other                                                     | Inconclusive: None Detected  |
| TEM NYS 198.4 NOB                | 04/29/2021    | Yellow                     |                                                               | 100.00% Other                                                     | None Detected                |
| Sample ID 86-1<br>062107143-0195 |               | Description<br>Homogeneity | New Bldg. - Bar - Behind Bar - VFT under Epoxy<br>Homogeneous |                                                                   |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    | Blue                       | None                                                          | 98.60% Other                                                      | 1.40% Chrysotile             |
| TEM NYS 198.4 NOB                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| Sample ID 86-2<br>062107143-0196 |               | Description<br>Homogeneity | New Bldg. - Bar - Behind Bar - VFT under Epoxy                |                                                                   |                              |
| PLM NYS 198.1 Friable            |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 VCM                |               |                            |                                                               |                                                                   | Not Analyzed                 |
| PLM NYS 198.6 NOB                | 04/26/2021    |                            |                                                               |                                                                   | Positive Stop (Not Analyzed) |
| TEM NYS 198.4 NOB                |               |                            |                                                               |                                                                   | Not Analyzed                 |

Initial report from: 04/28/2021 03:52:10



## EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514

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<http://www.EMSL.com> / [carleplacelab@emsl.com](mailto:carleplacelab@emsl.com)

EMSL Order: 062107143

Customer ID: H2ML50

Customer PO:

Project ID:

### Test Report: Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

#### Report Comments:

Sample Receipt Date: 4/22/2021

Sample Receipt Time: 3:42 PM

Analysis Completed Date: 4/26/2021

Analysis Completed Time: 2:57 PM

#### Analyst(s):

Erick Rosa PLM NYS 198.1 Friable (57)

Paulina Kasak PLM NYS 198.1 Friable (12)

Tomas Montes De Oca PLM NYS 198.1 Friable (23)

Steve Juscuk PLM NYS 198.6 NOB (82)

Keith McWilliams TEM NYS 198.4 NOB (73)

#### Samples reviewed and approved by:

Daniel Clarke, Asbestos Laboratory Manager  
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at [http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance\\_Rev070913.pdf](http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf) EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NYS ELAP 11469, NVLAP Lab Code 101048-10

Initial report from: 04/28/2021 03:52:10

062107143

H2M architects + engineers

Bulk Sheet and Chain of Custody

Page 1 OF 8

| H2M L50                                                                               |                      | Site Address<br>872 Blooming Grove Tpke., New Windsor, NY |          | Date Submitted:<br>4-22-21                  |         |
|---------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------|----------|---------------------------------------------|---------|
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |                      | Work Area<br>Entire Firehouse Interior                    |          | Turn Around Time:<br>1 week                 |         |
|                                                                                       |                      | Fax Results to:                                           |          | E-mail Results to:<br>KVanderSchuyt@H2M.com |         |
| Analytical Procedure:<br>(Circle One)                                                 |                      | NY ELAP Method 198.1<br>(friable in NY)                   |          | NY ELAP Method 198.6<br>(non-friable-NY)    |         |
|                                                                                       |                      | NY ELAP Method 198.4<br>(TEM)                             |          | Billing #<br>VGFD2001                       |         |
| Sample Number                                                                         | Location             | Sample Description                                        | Comments |                                             |         |
| 1                                                                                     | 1 Stair Vestibule    | Ceramic Floor Tile Setting Bed                            |          |                                             |         |
| 1                                                                                     | 2                    |                                                           |          |                                             |         |
| 2                                                                                     | 1                    |                                                           | Grout    |                                             |         |
| 2                                                                                     | 2                    |                                                           |          |                                             |         |
| 3                                                                                     | 1 Staircase          | 12x12 VFT Tan                                             |          |                                             |         |
| 3                                                                                     | 2                    |                                                           |          |                                             |         |
| 4                                                                                     | 1                    |                                                           | Mastic   |                                             |         |
| 4                                                                                     | 2                    |                                                           |          |                                             |         |
| 5                                                                                     | 1 New Bay            | Foam Mastic around door                                   |          |                                             |         |
| 5                                                                                     | 2                    |                                                           |          |                                             |         |
| 6                                                                                     | 1 2nd Flr Throughout | 12x12 White & Gray VFT                                    |          |                                             |         |
| 6                                                                                     | 2                    |                                                           |          |                                             |         |
| 7                                                                                     | 1                    |                                                           | Mastic   |                                             |         |
| 7                                                                                     | 2                    |                                                           |          |                                             |         |
| 8                                                                                     | 1 Bathroom           | Wall Tile Grout                                           |          |                                             |         |
| 8                                                                                     | 2                    |                                                           |          |                                             |         |
| 9                                                                                     | 1                    |                                                           | Glue     |                                             |         |
| 9                                                                                     | 2                    |                                                           |          |                                             |         |
| 10                                                                                    | 1                    | Floor Tile Grout                                          |          |                                             |         |
| 10                                                                                    | 2                    |                                                           |          |                                             |         |
| 11                                                                                    | 1                    |                                                           | Glue     |                                             |         |
| 11                                                                                    | 2                    |                                                           |          |                                             |         |
| 12                                                                                    | 1 Throughout Wall    | Joint Compound                                            |          |                                             |         |
| 12                                                                                    | 2                    |                                                           |          |                                             |         |
| 12                                                                                    | 3                    |                                                           |          |                                             |         |
| 12                                                                                    | 4/5                  |                                                           |          |                                             |         |
| Relinquished by (signature)                                                           |                      | Date                                                      | Time     | Received by (signature)                     | Date    |
|                                                                                       |                      | 4-22-21                                                   |          |                                             | 4-22-21 |
| Relinquished by (signature)                                                           |                      | Date                                                      | Time     | Received by (signature)                     | Date    |
|                                                                                       |                      |                                                           |          |                                             |         |

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4-23-21

EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528

Teresa Montealegre

Page 1 Of

8

4-28-21

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H2M architects + engineers

## Bulk Sheet and Chain of Custody

Page 2 OF 8

| H2M L50                                                                               |                        | Site Address                            |                                             | Date Submitted:               |                              |           |
|---------------------------------------------------------------------------------------|------------------------|-----------------------------------------|---------------------------------------------|-------------------------------|------------------------------|-----------|
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |                        | Work Area                               |                                             | Turn Around Time:             |                              |           |
|                                                                                       |                        | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.com | Number of Samples:            |                              |           |
| Analytical Procedure:<br>(Circle One)                                                 |                        | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM) | Billing #<br><b>VGFD2001</b> |           |
| Sample Number                                                                         | Location               | Sample Description                      |                                             | Comments                      |                              |           |
| 13 1                                                                                  | 2nd Floor Throughout   | Wall Gyp Board                          |                                             |                               |                              |           |
| 13 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 17 1                                                                                  |                        | Staircase 2x2 Ceiling Tile              |                                             |                               |                              |           |
| 17 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 15 1                                                                                  |                        | Bathroom 2x2 Old Ceiling Tile           |                                             |                               |                              |           |
| 15 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 16 1                                                                                  |                        | Office Add-on Orig Bay Wall Gyp Board   |                                             |                               |                              |           |
| 16 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 17 1                                                                                  |                        | Joint Compound                          |                                             |                               |                              |           |
| 17 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 18 1                                                                                  | Office Add-on Orig Bay | Ceiling Gypsum Board                    |                                             |                               |                              |           |
| 18 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 19 1                                                                                  |                        | Joint Compound                          |                                             |                               |                              |           |
| 19 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 19 3                                                                                  |                        |                                         |                                             |                               |                              |           |
| 20 1                                                                                  |                        | Capt. Office 12x12 VFT White/ls Blue    |                                             |                               |                              |           |
| 20 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 21 1                                                                                  |                        |                                         |                                             |                               |                              |           |
| 21 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 22 1                                                                                  |                        | Rolled Rubber Floor under 12x12         |                                             |                               |                              |           |
| 22 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 23 1                                                                                  | Capt. Office           | Epoxy Floor                             |                                             |                               |                              |           |
| 23 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| 24 1                                                                                  |                        | Blue Core Board                         |                                             |                               |                              |           |
| 24 2                                                                                  |                        |                                         |                                             |                               |                              |           |
| Relinquished by (signature)                                                           |                        | Date<br>4-22-21                         | Time                                        | Received by (signature)       | Date<br>4-22-21              | Agent of: |
| Relinquished by (signature)                                                           |                        | Date                                    | Time                                        | Received by (signature)       | Date                         | Agent of: |

Master  
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*Carle Place*  
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EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528  
James Montez De Oca 4/23-21

4.24.21  
paulin  
4-23-21

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H2M architects + engineers

## Bulk Sheet and Chain of Custody

Page 3 OF 8

|                                                                                       |          |                                         |                                             |                               |                                      |
|---------------------------------------------------------------------------------------|----------|-----------------------------------------|---------------------------------------------|-------------------------------|--------------------------------------|
| H2M L50                                                                               |          | Site Address                            |                                             | Date Submitted:               |                                      |
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |          | Work Area                               |                                             | Turn Around Time:             |                                      |
|                                                                                       |          | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.com |                               | Number of Samples:                   |
| Analytical Procedure:<br>(Circle One)                                                 |          | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM) | Billing #<br><b>VG-FD2001</b>        |
| Sample Number                                                                         | Location | Sample Description                      |                                             |                               | Comments                             |
| 25                                                                                    | 1        | Office Add-On Orig. Bay                 |                                             |                               | Capt. Office Blue Core Mastec        |
| 25                                                                                    | 2        |                                         |                                             |                               |                                      |
| 26                                                                                    | 1        |                                         |                                             |                               | 2 x 2 Ceiling Tile Small Fissure     |
| 26                                                                                    | 2        |                                         |                                             |                               |                                      |
| 27                                                                                    | 1        |                                         |                                             |                               | 1 x 1 Ceiling Tile Spline            |
| 27                                                                                    | 2        |                                         |                                             |                               |                                      |
| 28                                                                                    | 1        |                                         |                                             |                               | Window Caulk                         |
| 28                                                                                    | 2        |                                         |                                             |                               |                                      |
| 29                                                                                    | 1        | Original Bldg Bay                       |                                             |                               | Ceiling Gyp Board                    |
| 29                                                                                    | 2        |                                         |                                             |                               |                                      |
| 30                                                                                    | 1        |                                         |                                             |                               | Joint Compound                       |
| 30                                                                                    | 2        |                                         |                                             |                               |                                      |
| 30                                                                                    | 3        |                                         |                                             |                               |                                      |
| 30                                                                                    | 4        |                                         |                                             |                               |                                      |
| 30                                                                                    | 5        |                                         |                                             |                               |                                      |
| 31                                                                                    | 1        |                                         |                                             |                               | Wall Gyp Board                       |
| 31                                                                                    | 2        |                                         |                                             |                               |                                      |
| 32                                                                                    | 1        |                                         |                                             |                               | Joint Compound                       |
| 32                                                                                    | 2        |                                         |                                             |                               |                                      |
| 32                                                                                    | 3        |                                         |                                             |                               |                                      |
| 32                                                                                    | 4        |                                         |                                             |                               |                                      |
| 32                                                                                    | 5        |                                         |                                             |                               |                                      |
| 33                                                                                    | 1        | Waiting Area                            |                                             |                               | Ceiling Gyp Board above Ceiling Tile |
| 33                                                                                    | 2        |                                         |                                             |                               |                                      |
| 34                                                                                    | 1        |                                         |                                             |                               | Joint Compound above Ceiling Tile    |
| 34                                                                                    | 2        |                                         |                                             |                               |                                      |
| Relinquished by (signature)                                                           |          | Date                                    | Time                                        | Received by (signature)       | Date                                 |
|                                                                                       |          | 4-22-21                                 |                                             |                               | 4-22-21                              |
| Relinquished by (signature)                                                           |          | Date                                    | Time                                        | Received by (signature)       | Date                                 |
|                                                                                       |          |                                         |                                             |                               |                                      |

STOP AT FIRST POSITIVE!!!

4/24/21

Emsl 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528

Tomás Montalvo

4/24/21

8

4/28-21

4,24,21

paulin

4-23-21

062107143

H2M architects + engineers

## Bulk Sheet and Chain of Custody

Page 4 OF 8

| H2M L50                                                                               |          | Site Address                                                |                                             | Date Submitted:               |                              |
|---------------------------------------------------------------------------------------|----------|-------------------------------------------------------------|---------------------------------------------|-------------------------------|------------------------------|
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |          | Work Area                                                   |                                             | Turn Around Time:             |                              |
|                                                                                       |          | Fax Results to:                                             | E-mail Results to:<br>KVanderSchuyt@H2M.com | Number of Samples:            |                              |
| Analytical Procedure:<br>(Circle One)                                                 |          | NY ELAP Method 198.1<br>(friable in NY)                     | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM) | Billing #<br><b>VGFD2001</b> |
| Sample Number                                                                         | Location | Sample Description                                          |                                             | Comments                      |                              |
| 34                                                                                    | 3        | Original Building Working Area Ceiling Joint Compound above |                                             | Ceiling Tile                  |                              |
| 34                                                                                    | 4        |                                                             |                                             |                               |                              |
| 34                                                                                    | 5        |                                                             |                                             |                               |                              |
| 35                                                                                    | 1        | 2 x 2 Pinhole Ceiling Tile                                  |                                             |                               |                              |
| 35                                                                                    | 2        |                                                             |                                             |                               |                              |
| 36                                                                                    | 1        | Original Bldg Bay                                           | CMU                                         |                               |                              |
| 36                                                                                    | 2        |                                                             |                                             |                               |                              |
| 37                                                                                    | 1        |                                                             | Mortar                                      |                               |                              |
| 37                                                                                    | 2        |                                                             |                                             |                               |                              |
| 38                                                                                    | 1        |                                                             | EPOXY Floor                                 |                               |                              |
| 38                                                                                    | 2        |                                                             |                                             |                               |                              |
| 39                                                                                    | 1        |                                                             | Yellow Strip on Floor                       |                               |                              |
| 39                                                                                    | 2        |                                                             |                                             |                               |                              |
| 40                                                                                    | 1        | Lounge                                                      | Brown Cove                                  |                               |                              |
| 40                                                                                    | 2        |                                                             |                                             |                               |                              |
| 41                                                                                    | 1        |                                                             | Mastic                                      |                               |                              |
| 41                                                                                    | 2        |                                                             |                                             |                               |                              |
| 42                                                                                    | 1        | office/lounge                                               | 12x12 VFT white/blue streaks                |                               |                              |
| 42                                                                                    | 2        |                                                             |                                             |                               |                              |
| 43                                                                                    | 1        |                                                             |                                             | Mastic                        |                              |
| 43                                                                                    | 2        |                                                             |                                             |                               |                              |
| 44                                                                                    | 1        | 1st Floor Lobby/Lounge                                      | Ceramic Stone Tile Mortar                   | 21 APR 23 PM 11:34            |                              |
| 44                                                                                    | 2        |                                                             |                                             |                               |                              |
| 45                                                                                    | 1        |                                                             |                                             | Setting Bed                   |                              |
| 45                                                                                    | 2        |                                                             |                                             |                               |                              |
| Relinquished by (signature)                                                           |          | Date                                                        | Time                                        | Received by (signature)       | Date                         |
| Relinquished by (signature)                                                           |          | Date                                                        | Time                                        | Received by (signature)       | Date                         |

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CARLE PLACE, NY

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| H2M L50                                                                               |                         | Site Address                            |                                             | Date Submitted:               |                              |
|---------------------------------------------------------------------------------------|-------------------------|-----------------------------------------|---------------------------------------------|-------------------------------|------------------------------|
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |                         | Work Area                               |                                             | Turn Around Time:             |                              |
|                                                                                       |                         | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.com | Number of Samples:            |                              |
| Analytical Procedure:<br>(Circle One)                                                 |                         | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM) | Billing #<br><b>VCFD2001</b> |
| Sample Number                                                                         | Location                | Sample Description                      |                                             | Comments                      |                              |
| 46 1                                                                                  | Original Bldg Boiler Rm | Fire Stop Mortar                        |                                             |                               |                              |
| 46 2                                                                                  |                         |                                         |                                             |                               |                              |
| 47 1                                                                                  |                         | Chimney Flue Fire Stop Caulk            |                                             |                               |                              |
| 47 2                                                                                  |                         |                                         |                                             |                               |                              |
| 48 1                                                                                  |                         | Transite Ceiling                        |                                             |                               |                              |
| 48 2                                                                                  |                         |                                         |                                             |                               |                              |
| 49 1                                                                                  |                         | Window Caulk                            |                                             |                               |                              |
| 49 2                                                                                  |                         |                                         |                                             |                               |                              |
| 50 1                                                                                  | New Bldg 1st flr Bar    | Black Cove Base                         |                                             |                               |                              |
| 50 2                                                                                  |                         |                                         |                                             |                               |                              |
| 51 1                                                                                  |                         |                                         |                                             | Mastic                        |                              |
| 51 2                                                                                  |                         |                                         |                                             |                               |                              |
| 52 1                                                                                  | Bar Storage             | 12x12 VFT Yellow                        |                                             |                               |                              |
| 52 2                                                                                  |                         |                                         |                                             |                               |                              |
| 53 1                                                                                  |                         |                                         |                                             | Mastic                        |                              |
| 53 2                                                                                  |                         |                                         |                                             |                               |                              |
| 54 1                                                                                  | Bar                     | Carpet Mastic                           |                                             |                               |                              |
| 54 2                                                                                  |                         |                                         |                                             |                               |                              |
| 55 1                                                                                  |                         | Stucco over Brick                       |                                             |                               |                              |
| 55 2/3                                                                                |                         |                                         |                                             |                               |                              |
| 56 1                                                                                  |                         | Brick                                   |                                             |                               |                              |
| 56 2                                                                                  |                         |                                         |                                             |                               |                              |
| 57 1                                                                                  |                         | Mortar                                  |                                             |                               |                              |
| 57 2                                                                                  |                         |                                         |                                             |                               |                              |
| 58 1                                                                                  |                         | Green Epoxy behind bar                  |                                             |                               |                              |
| 58 2                                                                                  |                         |                                         |                                             |                               |                              |
| Relinquished by (signature)                                                           |                         | Date<br>4-22-21                         | Time                                        | Received by (signature)       | Date<br>4-22-21              |
| Relinquished by (signature)                                                           |                         | Date                                    | Time                                        | Received by (signature)       | Date                         |

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|                                                                                       |          |                                         |                                             |                                           |                               |
|---------------------------------------------------------------------------------------|----------|-----------------------------------------|---------------------------------------------|-------------------------------------------|-------------------------------|
| H2M L50                                                                               |          | Site Address                            |                                             | Date Submitted:                           |                               |
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |          | Work Area                               |                                             | Turn Around Time:                         |                               |
|                                                                                       |          | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.Com | Number of Samples:                        |                               |
| Analytical Procedure:<br>(Circle One)                                                 |          | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM)             | Billing #<br><b>VG FD2001</b> |
| Sample Number                                                                         | Location | Sample Description                      |                                             | Comments                                  |                               |
| 59                                                                                    | 1        | New Bldg 1st flr Bar                    |                                             | Floor Tile Mastic under Epoxy Ice Machine |                               |
| 59                                                                                    | 2        |                                         |                                             |                                           |                               |
| 60                                                                                    | 1        |                                         |                                             | Wall Fiber board in Bar Bathroom          |                               |
| 60                                                                                    | 2        |                                         |                                             |                                           |                               |
| 61                                                                                    | 1        | Meeting Rm Ceiling                      |                                             | Gypsum boar (Soft)                        |                               |
| 61                                                                                    | 2        |                                         |                                             |                                           |                               |
| 62                                                                                    | 1        |                                         |                                             | Joint Compound                            |                               |
| 62                                                                                    | 2        |                                         |                                             |                                           |                               |
| 62                                                                                    | 3        |                                         |                                             |                                           |                               |
| 62                                                                                    | 4        |                                         |                                             |                                           |                               |
| 62                                                                                    | 5        |                                         |                                             |                                           |                               |
| 63                                                                                    | 1        |                                         |                                             | Wall Gypsum Board                         |                               |
| 63                                                                                    | 2        |                                         |                                             |                                           |                               |
| 64                                                                                    | 1        |                                         |                                             | Joint Compound                            |                               |
| 64                                                                                    | 2        |                                         |                                             |                                           |                               |
| 64                                                                                    | 3        |                                         |                                             |                                           |                               |
| 64                                                                                    | 4        |                                         |                                             |                                           |                               |
| 64                                                                                    | 5        |                                         |                                             |                                           |                               |
| 64                                                                                    | 6        |                                         |                                             |                                           |                               |
| 64                                                                                    | 7        |                                         |                                             |                                           |                               |
| 65                                                                                    | 1        | Girls Bath                              |                                             | Wall Tile Grout                           |                               |
| 65                                                                                    | 2        |                                         |                                             |                                           |                               |
| 66                                                                                    | 1        |                                         |                                             | Glue                                      |                               |
| 66                                                                                    | 2        |                                         |                                             |                                           |                               |
| 67                                                                                    | 1        |                                         |                                             | Floor Tile Grout                          |                               |
| 67                                                                                    | 2        |                                         |                                             |                                           |                               |
| Relinquished by (signature)                                                           |          | Date                                    | Time                                        | Received by (signature)                   | Date                          |
|                                                                                       |          | 4-22-21                                 |                                             |                                           | 4/22/21                       |
| Relinquished by (signature)                                                           |          | Date                                    | Time                                        | Received by (signature)                   | Date                          |
|                                                                                       |          |                                         |                                             |                                           |                               |

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Jomir Montealegre 4/26/21

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4/23/21 4:30 PM 4/25/21

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|                                                                                       |                             |                                         |                                             |                               |                 |           |
|---------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------|---------------------------------------------|-------------------------------|-----------------|-----------|
| H2M L50                                                                               |                             | Site Address                            |                                             | Date Submitted:               |                 |           |
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |                             | Work Area                               |                                             | Turn Around Time:             |                 |           |
|                                                                                       |                             | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.Com | Number of Samples:            |                 |           |
| Analytical Procedure:<br>(Circle One)                                                 |                             | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM) |                 |           |
|                                                                                       |                             |                                         |                                             | Billing #<br><b>VGFD2001</b>  |                 |           |
| Sample Number                                                                         | Location                    | Sample Description                      |                                             | Comments                      |                 |           |
| 68 1                                                                                  | New Bldg 1st flr Girls Bath | Floor Tile Glue Dots                    |                                             |                               |                 |           |
| 68 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 69 1                                                                                  |                             |                                         |                                             | Setting Bed                   |                 |           |
| 69 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 70 1                                                                                  |                             | Wallboard behind Tiles                  |                                             |                               |                 |           |
| 70 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 71 1                                                                                  |                             | Meeting Rm                              | 12x12 VFT Blue (Top)                        |                               |                 |           |
| 71 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 72 1                                                                                  |                             |                                         |                                             |                               | Mastic          |           |
| 72 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 73 1                                                                                  |                             |                                         | 12x12 VFT White (Top)                       |                               |                 |           |
| 73 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 74 1                                                                                  |                             |                                         | VFT (Bottom)                                |                               |                 |           |
| 74 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 75 1                                                                                  |                             |                                         |                                             |                               | Mastic          |           |
| 75 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 76 1                                                                                  |                             | Mens Bath                               | Wall Tile                                   | GROUT                         |                 |           |
| 76 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 77 1                                                                                  |                             |                                         |                                             | Glue                          |                 |           |
| 77 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 78 1                                                                                  | Floor Tile                  |                                         | GROUT                                       |                               |                 |           |
| 78 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 79 1                                                                                  |                             |                                         | Glue Dot                                    |                               |                 |           |
| 79 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| 80 1                                                                                  |                             | Setting Bed                             |                                             |                               |                 |           |
| 80 2                                                                                  |                             |                                         |                                             |                               |                 |           |
| Relinquished by (signature)                                                           |                             | Date<br>4-22-21                         | Time                                        | Received by (signature)       | Date<br>4/22/21 | Agent of: |
| Relinquished by (signature)                                                           |                             | Date                                    | Time                                        | Received by (signature)       | Date            | Agent of: |

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Tomás Montes De Oca 4/26/21 Page 8 Of

8

**EMSL Analytical, Inc.**

528 Mineola Avenue, Carle Place, NY 11514

Phone/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com>[carleplacelab@emsl.com](mailto:carleplacelab@emsl.com)

EMSL Order: 062107471  
 CustomerID: H2ML50  
 CustomerPO:  
 ProjectID:

Attn: **Kyle Vanderschuyt**  
**H2M Architects and Engineers**  
**538 Broad Hollow Road**  
**4th Floor East**  
**Melville, NY 11747**

Phone: (631) 756-8000  
 Fax:  
 Received: 4/22/2021 03:41 PM  
 Collected: 4/21/2021

Project: **VGFD2001****Test Report: Lead in Paint Chips by Flame AAS (SW 846 3051A/7000B)\***

| <i>Client Sample Description</i>                 | <i>Lab ID</i>  | <i>Collected</i> | <i>Analyzed</i> | <i>Weight</i> | <i>Lead Concentration</i> |
|--------------------------------------------------|----------------|------------------|-----------------|---------------|---------------------------|
| 1                                                | 062107471-0001 | 4/21/2021        | 4/29/2021       | 0.2513 g      | 0.017 % wt                |
| Site: 2nd Floor, throughout,wall,gyp,white       |                |                  |                 |               |                           |
| 2                                                | 062107471-0002 | 4/21/2021        | 4/29/2021       | 0.1098 g      | 0.18 % wt                 |
| Site: 2nd Floor, wall,wood,green                 |                |                  |                 |               |                           |
| 4                                                | 062107471-0003 | 4/21/2021        | 4/29/2021       | 0.1578 g      | 0.24 % wt                 |
| Site: Original Bldg, brown,door,metal            |                |                  |                 |               |                           |
| 5                                                | 062107471-0004 | 4/21/2021        | 4/29/2021       | 0.2741 g      | 0.27 % wt                 |
| Site: Original Bay,d.gray,wall,cmu               |                |                  |                 |               |                           |
| 6                                                | 062107471-0005 | 4/21/2021        | 4/29/2021       | 0.2809 g      | 0.036 % wt                |
| Site: Original Bay,l.gray,wall,cmu               |                |                  |                 |               |                           |
| 7                                                | 062107471-0006 | 4/21/2021        | 4/29/2021       | 0.2757 g      | 0.048 % wt                |
| Site: Original Bldg/lounge/office,white,wall,gyp |                |                  |                 |               |                           |
| 8                                                | 062107471-0007 | 4/21/2021        | 4/29/2021       | 0.2809 g      | 0.051 % wt                |
| Site: Add on offices,wall,gyp,white              |                |                  |                 |               |                           |
| 9                                                | 062107471-0008 | 4/21/2021        | 4/29/2021       | 0.2658 g      | 0.040 % wt                |
| Site: Add on offices,wall,door,metal,gray        |                |                  |                 |               |                           |
| 10                                               | 062107471-0009 | 4/21/2021        | 4/29/2021       | 0.2789 g      | 0.095 % wt                |
| Site: New Bay,floor,concrete,yellow              |                |                  |                 |               |                           |
| 11                                               | 062107471-0010 | 4/21/2021        | 4/29/2021       | 0.2806 g      | 0.060 % wt                |
| Site: New Bay,wall,wood,pink                     |                |                  |                 |               |                           |
| 12                                               | 062107471-0011 | 4/21/2021        | 4/29/2021       | 0.1766 g      | <0.011 % wt               |
| Site: New Bldg meeting rm,heater,metal,orange    |                |                  |                 |               |                           |
| 13                                               | 062107471-0012 | 4/21/2021        | 4/29/2021       | 0.0232 g      | <0.086 % wt               |
| Site: New Bldg kitchen,doorframe,metal,brown     |                |                  |                 |               |                           |
| 14                                               | 062107471-0013 | 4/21/2021        | 4/29/2021       | 0.2435 g      | 0.79 % wt                 |
| Site: New Bldg ceiling,gyp,white                 |                |                  |                 |               |                           |
| 15                                               | 062107471-0014 | 4/21/2021        | 4/29/2021       | 0.2703 g      | <0.0080 % wt              |
| Site: New Bldg wall,gyp,white                    |                |                  |                 |               |                           |
| 3                                                | 062107471-0015 | 4/21/2021        | 4/29/2021       | 0.2619 g      | <0.0080 % wt              |
| Site: 2nd floor,wall,wood,yellow                 |                |                  |                 |               |                           |

Alger Liang, Lead Laboratory Manager  
 or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted.

Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008% wt based on the minimum sample weight per our SOP. "<" (less than) result signifies the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY Lab ID 102344 is accredited by AIHA LAP, LLC in the env. accreditation program for Lead in Paint, CT PH-0249, NYS ELAP 11469, CA 2339

Initial report from 04/29/2021 14:22:51



EMSL ANALYTICAL, INC.  
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## Lead (Pb) Chain of Custody

EMSL Order ID (Lab Use Only):

062107471

Carle Place, NY 11514

PHONE: (516) 997-7251

FAX: (516) 997-7528

|                                                                                                                                     |                                        |                                                                                                                                                      |                                  |
|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Company: H2ML50                                                                                                                     |                                        | EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different<br>If Bill to is Different note instructions in Comments** |                                  |
| Street: 290 Broadhollow Road Suite 400E                                                                                             |                                        | Third Party Billing requires written authorization from third party                                                                                  |                                  |
| City: Melville                                                                                                                      | State/Province: NY                     | Zip/Postal Code: 11747                                                                                                                               | Country: US                      |
| Report To (Name): Kyle VanderSchuyt                                                                                                 |                                        | Telephone #: 6313925230                                                                                                                              |                                  |
| Email Address: kvanderschuyt@h2m.com                                                                                                |                                        | Fax #:                                                                                                                                               | Purchase Order:                  |
| Project Name/Number: VGFD2001                                                                                                       |                                        | Please Provide Results: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email                                                       |                                  |
| U.S. State Samples Taken: NY                                                                                                        |                                        | CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt                                              |                                  |
| Turnaround Time (TAT) Options* - Please Check                                                                                       |                                        |                                                                                                                                                      |                                  |
| <input type="checkbox"/> 3 Hour                                                                                                     | <input type="checkbox"/> 6 Hour        | <input type="checkbox"/> 24 Hour                                                                                                                     | <input type="checkbox"/> 48 Hour |
| <input type="checkbox"/> 72 Hour                                                                                                    | <input type="checkbox"/> 96 Hour       | <input checked="" type="checkbox"/> 1 Week                                                                                                           | <input type="checkbox"/> 2 Week  |
| *Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide                                       |                                        |                                                                                                                                                      |                                  |
| Matrix                                                                                                                              | Method                                 | Instrument                                                                                                                                           | Reporting Limit                  |
| Chips <input checked="" type="checkbox"/> % by wt. <input type="checkbox"/> mg/cm <sup>2</sup> <input type="checkbox"/> ppm (mg/kg) | SW846-7000B                            | Flame Atomic Absorption                                                                                                                              | 0.01%                            |
| Air                                                                                                                                 | NIOSH 7082                             | Flame Atomic Absorption                                                                                                                              | 4 µg/filter                      |
|                                                                                                                                     | NIOSH 7105                             | Graphite Furnace AA                                                                                                                                  | 0.03 µg/filter                   |
|                                                                                                                                     | NIOSH 7300M/NIOSH 7303                 | ICP-OES                                                                                                                                              | 0.5 µg/filter                    |
| Wipe* <input type="checkbox"/> ASTM <input type="checkbox"/> non ASTM <input type="checkbox"/>                                      | SW846-7000B                            | Flame Atomic Absorption                                                                                                                              | 10 µg/wipe                       |
| *if no box checked, non-ASTM Wipe assumed                                                                                           | SW846-6010B or C                       | ICP-OES                                                                                                                                              | 1.0 µg/wipe                      |
| TCLP                                                                                                                                | SW846-1311/7000B/SM 3111B              | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                   |
|                                                                                                                                     | SW846-1311/SW846-6010B or C            | ICP-OES                                                                                                                                              | 0.1 mg/L (ppm)                   |
| SPLP                                                                                                                                | SW846-1312/7000B/SM 3111B              | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                   |
|                                                                                                                                     | SW846-1312/SW846-6010B or C            | ICP-OES                                                                                                                                              | 0.1 mg/L (ppm)                   |
| TTL                                                                                                                                 | 22 CCR App. II, 7000B/7420             | Flame Atomic Absorption                                                                                                                              | 40 mg/kg (ppm)                   |
|                                                                                                                                     | 22 CCR App. II, SW846-6010B or C       | ICP-OES                                                                                                                                              | 2 mg/kg (ppm)                    |
| STLC                                                                                                                                | 22 CCR App. II, 7000B/7420             | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                   |
|                                                                                                                                     | 22 CCR App. II, SW846-6010B or C       | ICP-OES                                                                                                                                              | 0.1 mg/L (ppm)                   |
| Soil                                                                                                                                | SW846-7000B                            | Flame Atomic Absorption                                                                                                                              | 40 mg/kg (ppm)                   |
|                                                                                                                                     | SW846-6010B or C                       | ICP-OES                                                                                                                                              | 2 mg/kg (ppm)                    |
| Wastewater Unpreserved <input type="checkbox"/>                                                                                     | SM3111B/SW846-7000B                    | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                   |
| Preserved with HNO <sub>3</sub> pH < 2 <input type="checkbox"/>                                                                     | EPA 200.9                              | Graphite Furnace AA                                                                                                                                  | 0.003 mg/L (ppm)                 |
|                                                                                                                                     | EPA 200.7                              | ICP-OES                                                                                                                                              | 0.020 mg/L (ppm)                 |
| Drinking Water Unpreserved <input type="checkbox"/>                                                                                 | EPA 200.8                              | ICP-MS                                                                                                                                               | 0.001 mg/L (ppm)                 |
| Preserved with HNO <sub>3</sub> pH < 2 <input type="checkbox"/>                                                                     | EPA 200.9                              | Graphite Furnace AA                                                                                                                                  | 0.003 mg/L (ppm)                 |
|                                                                                                                                     | EPA 200.5                              | ICP-OES                                                                                                                                              | 0.003 mg/L (ppm)                 |
| TSP/SPM Filter                                                                                                                      | 40 CFR Part 50                         | ICP-OES                                                                                                                                              | 12 µg/filter                     |
|                                                                                                                                     | 40 CFR Part 50                         | Graphite Furnace AA                                                                                                                                  | 3.6 µg/filter                    |
| Other:                                                                                                                              |                                        |                                                                                                                                                      |                                  |
| Name of Sampler: Frank Accavito                                                                                                     |                                        | Signature of Sampler:                                                                                                                                |                                  |
| Sample #                                                                                                                            | Location                               | Volume/Area                                                                                                                                          | Date/Time Sampled                |
| 1                                                                                                                                   | 2nd floor, throughout, wall, gyp, etc. | 2 in x 2 in                                                                                                                                          | 4/21/21                          |
| 2                                                                                                                                   | 2nd floor, wall, wood, green           |                                                                                                                                                      | 1                                |
| Client Sample #s                                                                                                                    | Total # of Samples:                    |                                                                                                                                                      |                                  |
| Relinquished (Client):                                                                                                              | Date: 4/22/21                          | Time:                                                                                                                                                |                                  |
| Received (Lab):                                                                                                                     | Date: 4/22/21                          | Time:                                                                                                                                                |                                  |
| Comments:                                                                                                                           |                                        |                                                                                                                                                      |                                  |

Pb Saw 4/29/21  
A. Young 04/29/21

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## LEAD (Pb) CHAIN OF CUSTODY

EMSL ORDER ID (Lab Use Only):

062107471

EMSL Analytical, Inc.  
528 Mineola Avenue

Carle Place, NY 11514

PHONE: (516) 997-7251

FAX: (516) 997-7528

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

| Sample #                       | Location                                      | Volume/Area | Date/Time Sampled |
|--------------------------------|-----------------------------------------------|-------------|-------------------|
| FJA 4                          | Original Bldg, Brown, Door, Metal             | 2'x2'       | 4/21/21           |
| FJA 5                          | Original Bay, D. Gray, Wall, CMU              |             |                   |
| FJA 6                          | Original Bay, L. Gray, Wall CMU               |             |                   |
| FJA 7                          | Original Bldg/Lounge/office, White, Wall, Gyp |             |                   |
| FJA 8                          | Add on offices, Wall, Gyp, White              |             |                   |
| FJA 9                          | Add on offices, Door, Metal, Gray             |             |                   |
| FJA 10                         | New Bay, Floor, Concrete, Yellow              |             |                   |
| FJA 11                         | New Bay, Wall, Wood, Pink                     |             |                   |
| FJA 12                         | New Bldg Meeting Rm, Heater, Metal, Orange    |             |                   |
| FJA 13                         | New Bldg Kitchen, Doorframe, Metal, Brown     |             |                   |
| FJA 14                         | New Bldg Ceiling, Gyp, White                  |             |                   |
| FJA 15                         | New Bldg Wall, Gyp, White                     |             |                   |
| 3                              | 2nd floor, wall, wood, yellow                 |             |                   |
|                                |                                               |             |                   |
|                                |                                               |             |                   |
|                                |                                               |             |                   |
|                                |                                               |             |                   |
|                                |                                               |             |                   |
| Comments/Special Instructions: |                                               |             |                   |

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21 APR 22 PM 3:42

**EMSL Analytical, Inc.**

528 Mineola Avenue, Carle Place, NY 11514

Phone/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com>[carleplacelab@emsl.com](mailto:carleplacelab@emsl.com)

EMSL Order: 062108298  
CustomerID: H2ML50  
CustomerPO:  
ProjectID:

Attn: **Kyle P. Vander Schuyt**  
**H2M Architects and Engineers**  
**538 Broad Hollow Road**  
**4th Floor East**  
**Melville, NY 11747**

Phone: (631) 756-8000  
Fax:  
Received: 05/07/21 2:36 PM  
Collected: 5/4/2021

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3051A/7000B)\***

| <i>Client Sample Description</i>   | <i>Lab ID</i>  | <i>Collected</i> | <i>Analyzed</i> | <i>Lead Concentration</i> |
|------------------------------------|----------------|------------------|-----------------|---------------------------|
| 17                                 | 062108298-0001 | 5/4/2021         | 5/12/2021       | <0.0080 % wt              |
| Site: Back Door/Metal/Lintel/Green |                |                  |                 |                           |
| 18                                 | 062108298-0002 | 5/4/2021         | 5/12/2021       | 0.030 % wt                |
| Site: Shed/Int. Wall/CMO/Pink      |                |                  |                 |                           |
| 19                                 | 062108298-0003 | 5/4/2021         | 5/12/2021       | <0.0080 % wt              |
| Site: Shed/Wood/Door/Lintel/Green  |                |                  |                 |                           |

Alger Liang, Lead Laboratory Manager  
or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted.

Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008% wt based on the minimum sample weight per our SOP. "<" (less than) result signifies the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY Lab ID 102344 is accredited by AIHA LAP, LLC in the env. accreditation program for Lead in Paint, CT PH-0249, NYS ELAP 11469, CA 2339

Initial report from 05/13/2021 00:18:13

EMSL ANALYTICAL, INC.  
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## Lead (Pb) Chain of Custody

EMSL Order ID (Lab Use Only)

Carle Place, NY 11514  
PHONE: (516) 997-7251  
FAX: (516) 997-7528

062108298

|                                                                                                                                                                                                                                                                                |                                    |                                                                                                                                                      |                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Company: H2ML50                                                                                                                                                                                                                                                                |                                    | EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different<br>If Bill to is Different note instructions in Comments** |                                                                            |
| Street: 290 Broadhollow Road Suite 400E                                                                                                                                                                                                                                        |                                    | Third Party Billing requires written authorization from third party                                                                                  |                                                                            |
| City: Melville                                                                                                                                                                                                                                                                 | State/Province: NY                 | Zip/Postal Code: 11747                                                                                                                               | Country: US                                                                |
| Report To (Name): Kyle VanderSchuyt                                                                                                                                                                                                                                            |                                    | Telephone #: 6313925230                                                                                                                              |                                                                            |
| Email Address: kvanderschuyt@h2m.com                                                                                                                                                                                                                                           |                                    | Fax #:                                                                                                                                               | Purchase Order:                                                            |
| Project Name/Number:                                                                                                                                                                                                                                                           |                                    | Please Provide Results: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email                                                       |                                                                            |
| U.S. State Samples Taken: NY                                                                                                                                                                                                                                                   |                                    | CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt                                              |                                                                            |
| Turnaround Time (TAT) Options* - Please Check                                                                                                                                                                                                                                  |                                    |                                                                                                                                                      |                                                                            |
| <input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input checked="" type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week |                                    |                                                                                                                                                      |                                                                            |
| *Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide                                                                                                                                                                                  |                                    |                                                                                                                                                      |                                                                            |
| Matrix                                                                                                                                                                                                                                                                         | Method                             | Instrument                                                                                                                                           | Reporting Limit                                                            |
| Chips <input type="checkbox"/> % by wt. <input type="checkbox"/> mg/cm <sup>2</sup> <input type="checkbox"/> ppm (mg/kg)                                                                                                                                                       | SW846-7000B                        | Flame Atomic Absorption                                                                                                                              | 0.01%                                                                      |
| Air                                                                                                                                                                                                                                                                            | NIOSH 7082                         | Flame Atomic Absorption                                                                                                                              | 4 µg/filter                                                                |
|                                                                                                                                                                                                                                                                                | NIOSH 7105                         | Graphite Furnace AA                                                                                                                                  | 0.03 µg/filter                                                             |
|                                                                                                                                                                                                                                                                                | NIOSH 7300M/NIOSH 7303             | ICP-OES                                                                                                                                              | 0.5 µg/filter                                                              |
| Wipe*      ASTM <input type="checkbox"/><br>non ASTM <input type="checkbox"/><br>*if no box checked, non-ASTM Wipe assumed                                                                                                                                                     | SW846-7000B                        | Flame Atomic Absorption                                                                                                                              | 10 µg/wipe                                                                 |
|                                                                                                                                                                                                                                                                                | SW846-6010B or C                   | ICP-OES                                                                                                                                              | 1.0 µg/wipe                                                                |
| TCLP                                                                                                                                                                                                                                                                           | SW846-1311/7000B/SM 3111B          | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                                                             |
|                                                                                                                                                                                                                                                                                | SW846-1311/SW846-6010B or C        | ICP-OES                                                                                                                                              | 0.1 mg/L (ppm)                                                             |
| SPLP                                                                                                                                                                                                                                                                           | SW846-1312/7000B/SM 3111B          | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                                                             |
|                                                                                                                                                                                                                                                                                | SW846-1312/SW846-6010B or C        | ICP-OES                                                                                                                                              | 0.1 mg/L (ppm)                                                             |
| TTL                                                                                                                                                                                                                                                                            | 22 CCR App. II, 7000B/7420         | Flame Atomic Absorption                                                                                                                              | 40 mg/kg (ppm)                                                             |
|                                                                                                                                                                                                                                                                                | 22 CCR App. II, SW846-6010B or C   | ICP-OES                                                                                                                                              | 2 mg/kg (ppm)                                                              |
| STLC                                                                                                                                                                                                                                                                           | 22 CCR App. II, 7000B/7420         | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                                                             |
|                                                                                                                                                                                                                                                                                | 22 CCR App. II, SW846-6010B or C   | ICP-OES                                                                                                                                              | 0.1 mg/L (ppm)                                                             |
| Soil                                                                                                                                                                                                                                                                           | SW846-7000B                        | Flame Atomic Absorption                                                                                                                              | 40 mg/kg (ppm)                                                             |
|                                                                                                                                                                                                                                                                                | SW846-6010B or C                   | ICP-OES                                                                                                                                              | 2 mg/kg (ppm)                                                              |
| Wastewater    Unpreserved <input type="checkbox"/><br>Preserved with HNO <sub>3</sub> pH < 2 <input type="checkbox"/>                                                                                                                                                          | SM3111B/SW846-7000B                | Flame Atomic Absorption                                                                                                                              | 0.4 mg/L (ppm)                                                             |
|                                                                                                                                                                                                                                                                                | EPA 200.9                          | Graphite Furnace AA                                                                                                                                  | 0.003 mg/L (ppm)                                                           |
|                                                                                                                                                                                                                                                                                | EPA 200.7                          | ICP-OES                                                                                                                                              | 0.020 mg/L (ppm)                                                           |
| Drinking Water    Unpreserved <input type="checkbox"/><br>Preserved with HNO <sub>3</sub> pH < 2 <input type="checkbox"/>                                                                                                                                                      | EPA 200.8                          | ICP-MS                                                                                                                                               | 0.001 mg/L (ppm)                                                           |
|                                                                                                                                                                                                                                                                                | EPA 200.9                          | Graphite Furnace AA                                                                                                                                  | 0.003 mg/L (ppm)                                                           |
|                                                                                                                                                                                                                                                                                | EPA 200.5                          | ICP-OES                                                                                                                                              | 0.003 mg/L (ppm)                                                           |
| TSP/SPM Filter                                                                                                                                                                                                                                                                 | 40 CFR Part 50                     | ICP-OES                                                                                                                                              | 12 µg/filter                                                               |
|                                                                                                                                                                                                                                                                                | 40 CFR Part 50                     | Graphite Furnace AA                                                                                                                                  | 3.6 µg/filter                                                              |
| Other:                                                                                                                                                                                                                                                                         |                                    |                                                                                                                                                      |                                                                            |
| Name of Sampler: <i>[Signature]</i>                                                                                                                                                                                                                                            |                                    | Signature of Sampler:                                                                                                                                |                                                                            |
| Sample #                                                                                                                                                                                                                                                                       | Location                           | Volume/Area                                                                                                                                          | Date/Time Sampled                                                          |
| 17                                                                                                                                                                                                                                                                             | Back Docs / Metal / Lintel / Green | 2 in <sup>2</sup>                                                                                                                                    | 5-4-21                                                                     |
| 18                                                                                                                                                                                                                                                                             | Shed / Int. Wall / CMO / Pink      | 1                                                                                                                                                    | 5-4-21                                                                     |
| Client Sample #s                                                                                                                                                                                                                                                               | Total # of Samples:                |                                                                                                                                                      | 21                                                                         |
| Relinquished (Client): <i>[Signature]</i>                                                                                                                                                                                                                                      | Date: 5-4-21                       | Time:                                                                                                                                                | RECEIVED<br>EMSL ANALYTICAL, INC.<br>CARLE PLACE, NY<br>21 MAY - 7 PM 2:36 |
| Received (Lab): <i>[Signature]</i>                                                                                                                                                                                                                                             | Date: 5-7-21                       | Time: 2:36 PM                                                                                                                                        |                                                                            |
| Comments:                                                                                                                                                                                                                                                                      |                                    |                                                                                                                                                      |                                                                            |

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**EMSI ORDER ID** (Lab Use Only):

ISI ORDER ID (Lab Use Only): 062108298

[illegible]

Page 2 of 2 pages





Please Reply To:

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117 EAST 30TH ST.

NEW YORK, NY 10016

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***LABORATORY ELECTRONIC TRANSMITTAL***

**To:** Brenda Muller  
H2M Group  
**Fax #:** (631) 694-4122

**Email:**

**From:** Gabriella Morozov  
**AmeriSci Job #:** 221051657  
**Subject:** ELAP-PLM/TEM 5 day Results  
**Client Project:** 872 Blooming Grove, New Windsor - Entire Firehouse

**Date:** Wednesday, May 12, 2021  
**Time:** 10:55:10  
**Comments:**

**Number of Pages:** \_\_\_\_\_  
(including cover sheet)

NOTE: Attached report is to be considered preliminary until final review with accompanying analysis summary letter is issued.

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## PLM Bulk Asbestos Report

H2M Group  
Attn: Brenda Muller  
538 Broad Hollow Road  
4th Floor East  
Melville, NY 11747

**Date Received** 05/07/21 **AmeriSci Job #** 221051657  
**Date Examined** 05/11/21 **P.O. #**  
**ELAP #** 11480 **Page** 1 **of** 18  
**RE:** 872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                          | Lab No.                                                          | Asbestos Present | Total % Asbestos                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 87-1<br>87                                                                                                                                                | 221051657-01<br><b>Location:</b> New Garage Roof - Vapor Barrier | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 3.9%           |                                                                  |                  |                                                                 |
| 87-2<br>87                                                                                                                                                | 221051657-02<br><b>Location:</b> New Garage Roof - Vapor Barrier | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 4.8%           |                                                                  |                  |                                                                 |
| 88-1<br>88                                                                                                                                                | 221051657-03<br><b>Location:</b> New Garage Roof - Built-Up      | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10.3%          |                                                                  |                  |                                                                 |
| 88-2<br>88                                                                                                                                                | 221051657-04<br><b>Location:</b> New Garage Roof - Built-Up      | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 11.2%          |                                                                  |                  |                                                                 |
| 89-1<br>89                                                                                                                                                | 221051657-05<br><b>Location:</b> New Garage Roof - Fiberboard    | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 60%, Non-fibrous 40% |                                                                  |                  |                                                                 |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                       | Lab No.                                                             | Asbestos Present | Total % Asbestos                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| 89-2<br>89                                                                                                                                                             | 221051657-06<br><b>Location:</b> New Garage Roof - Fiberboard       | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 60%, Non-fibrous 40%              |                                                                     |                  |                                                                                       |
| 90-1<br>90                                                                                                                                                             | 221051657-07<br><b>Location:</b> New Garage Roof - Vent Tar         | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 13.8%                       |                                                                     |                  |                                                                                       |
| 90-2<br>90                                                                                                                                                             | 221051657-08<br><b>Location:</b> New Garage Roof - Vent Tar         | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 14.2%                       |                                                                     |                  |                                                                                       |
| 91-1<br>91                                                                                                                                                             | 221051657-09<br><b>Location:</b> New Garage Roof - Patch Tar        | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10.1%                       |                                                                     |                  |                                                                                       |
| 91-2<br>91                                                                                                                                                             | 221051657-10<br><b>Location:</b> New Garage Roof - Patch Tar        | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 13.2%                       |                                                                     |                  |                                                                                       |
| 92-1<br>92                                                                                                                                                             | 221051657-11<br><b>Location:</b> New Garage Roof - Parapet Flashing | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 11.9% |                                                                     |                  |                                                                                       |

## PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                      | Lab No.                                                             | Asbestos Present | Total % Asbestos                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| 92-2<br>92                                                                                                                                                            | 221051657-12<br><b>Location:</b> New Garage Roof - Parapet Flashing | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 9.1% |                                                                     |                  |                                                                                       |
| 93-1<br>93                                                                                                                                                            | 221051657-13<br><b>Location:</b> Orig. Roof Over Lounge -Top Layer  | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.2%                       |                                                                     |                  |                                                                                       |
| 93-2<br>93                                                                                                                                                            | 221051657-14<br><b>Location:</b> Orig. Roof Over Lounge -Top Layer  | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.3%                       |                                                                     |                  |                                                                                       |
| 94-1<br>94                                                                                                                                                            | 221051657-15<br><b>Location:</b> Orig. Roof Over Lounge -Built-Up   | <b>Yes</b>       | 5.8%<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                      |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 5.8 %<br><b>Other Material:</b> Non-fibrous 20.1%     |                                                                     |                  |                                                                                       |
| 94-2<br>94                                                                                                                                                            | 221051657-16<br><b>Location:</b> Orig. Roof Over Lounge -Built-Up   |                  | NA/PS                                                                                 |
| <b>Analyst Description:</b> Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b>                                                                         |                                                                     |                  |                                                                                       |
| 95-1<br>95                                                                                                                                                            | 221051657-17<br><b>Location:</b> Orig. Roof Over Lounge -Fiberboard | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 80%, Non-fibrous 20%             |                                                                     |                  |                                                                                       |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                      | Lab No.                                                              | Asbestos Present | Total % Asbestos                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| 95-2<br>95                                                                                                                                                            | 221051657-18<br><b>Location:</b> Orig. Roof Over Lounge -Fiberboard  | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 80%, Non-fibrous 20%             |                                                                      |                  |                                                                                       |
| 96-1<br>96                                                                                                                                                            | 221051657-19<br><b>Location:</b> New Bldg. Roof - Seam Tar           | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 9.7%                       |                                                                      |                  |                                                                                       |
| 96-2<br>96                                                                                                                                                            | 221051657-20<br><b>Location:</b> New Bldg. Roof - Seam Tar           | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 13.7%                      |                                                                      |                  |                                                                                       |
| 97-1<br>97                                                                                                                                                            | 221051657-21<br><b>Location:</b> New Bldg. Roof - Top Of Parapet Tar | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10.2%                      |                                                                      |                  |                                                                                       |
| 97-2<br>97                                                                                                                                                            | 221051657-22<br><b>Location:</b> New Bldg. Roof - Top Of Parapet Tar | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10.9%                      |                                                                      |                  |                                                                                       |
| 98-1<br>98                                                                                                                                                            | 221051657-23<br><b>Location:</b> New Bldg. Roof - Parapet Flashing   | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 6.2% |                                                                      |                  |                                                                                       |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                       | Lab No.                                                                                | Asbestos Present | Total % Asbestos                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| 98-2<br>98                                                                                                                                                             | 221051657-24<br><b>Location:</b> New Bldg. Roof - Parapet Flashing                     | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 10.9% |                                                                                        |                  |                                                                                       |
| 99-1<br>99                                                                                                                                                             | 221051657-25<br><b>Location:</b> New Bldg. Roof - HVAC Flashing                        | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 14.5% |                                                                                        |                  |                                                                                       |
| 99-2<br>99                                                                                                                                                             | 221051657-26<br><b>Location:</b> New Bldg. Roof - HVAC Flashing                        | <b>Yes</b>       | 1.9%<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                      |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 1.9 %<br><b>Other Material:</b> Non-fibrous 14.9%      |                                                                                        |                  |                                                                                       |
| 100-1<br>100                                                                                                                                                           | 221051657-27<br><b>Location:</b> New Bldg. Roof To 2nd Fl. - Parapet Flashing          | <b>Yes</b>       | 2.5%<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                      |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 2.5 %<br><b>Other Material:</b> Non-fibrous 11.2%      |                                                                                        |                  |                                                                                       |
| 100-2<br>100                                                                                                                                                           | 221051657-28<br><b>Location:</b> New Bldg. Roof To 2nd Fl. - Parapet Flashing          |                  | NA/PS                                                                                 |
| <b>Analyst Description:</b> Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b>                                                                          |                                                                                        |                  |                                                                                       |
| 101-1<br>101                                                                                                                                                           | 221051657-29<br><b>Location:</b> New Bldg. Roof To New Garage - Parapet Caulk On Metal | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 19.5%                        |                                                                                        |                  |                                                                                       |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                      | Lab No.                                                                                | Asbestos Present | Total % Asbestos                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| 101-2<br>101                                                                                                                                                          | 221051657-30<br><b>Location:</b> New Bldg. Roof To New Garage - Parapet Caulk On Metal | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 20.7%                       |                                                                                        |                  |                                                                                       |
| 102-1<br>102                                                                                                                                                          | 221051657-31<br><b>Location:</b> New Bldg. Roof - Silver Top Layer                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Silver/Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.4%                |                                                                                        |                  |                                                                                       |
| 102-2<br>102                                                                                                                                                          | 221051657-32<br><b>Location:</b> New Bldg. Roof - Silver Top Layer                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Silver/Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 2.7%                |                                                                                        |                  |                                                                                       |
| 103-1<br>103                                                                                                                                                          | 221051657-33<br><b>Location:</b> New Bldg. Roof - Black 2nd Layer                      | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 3.7% |                                                                                        |                  |                                                                                       |
| 103-2<br>103                                                                                                                                                          | 221051657-34<br><b>Location:</b> New Bldg. Roof - Black 2nd Layer                      | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 6.1% |                                                                                        |                  |                                                                                       |
| 104-1<br>104                                                                                                                                                          | 221051657-35<br><b>Location:</b> New Bldg. Roof - Built-Up                             | <b>Yes</b>       | 5.1%<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                      |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 5.1 %<br><b>Other Material:</b> Non-fibrous 19%       |                                                                                        |                  |                                                                                       |

# PLM Bulk Asbestos Report

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| Client No. / HGA                                                                                                                                          | Lab No.                                                   | Asbestos Present | Total % Asbestos                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 104-2<br>104                                                                                                                                              | 221051657-36<br>Location: New Bldg. Roof - Built-Up       |                  | NA/PS                                                           |
| <b>Analyst Description:</b> Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b>                                                             |                                                           |                  |                                                                 |
| 105-1<br>105                                                                                                                                              | 221051657-37<br>Location: New Bldg. Roof - Fiberboard     | No               | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 80%, Non-fibrous 20% |                                                           |                  |                                                                 |
| 105-2<br>105                                                                                                                                              | 221051657-38<br>Location: New Bldg. Roof - Fiberboard     | No               | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 80%, Non-fibrous 20% |                                                           |                  |                                                                 |
| 106-1<br>106                                                                                                                                              | 221051657-39<br>Location: New Bldg. Roof - Tar Patches    | No               | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10%            |                                                           |                  |                                                                 |
| 106-2<br>106                                                                                                                                              | 221051657-40<br>Location: New Bldg. Roof - Tar Patches    | No               | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10%            |                                                           |                  |                                                                 |
| 107-1<br>107                                                                                                                                              | 221051657-41<br>Location: 2nd Fl. / Roof - 1st Top Silver | No               | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Silver/Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.7%    |                                                           |                  |                                                                 |



# PLM Bulk Asbestos Report

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| Client No. / HGA                                                                                                                                                      | Lab No.                                                   | Asbestos Present | Total % Asbestos                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| 107-2<br>107                                                                                                                                                          | 221051657-42<br>Location: 2nd Fl. / Roof - 1st Top Silver | No               | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Silver/Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 5.5%                |                                                           |                  |                                                                                       |
| 108-1<br>108                                                                                                                                                          | 221051657-43<br>Location: 2nd Fl. / Roof - 2nd Top Black  | Yes              | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 4.8% |                                                           |                  |                                                                                       |
| 108-2<br>108                                                                                                                                                          | 221051657-44<br>Location: 2nd Fl. / Roof - 2nd Top Black  | Yes              | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 4.3% |                                                           |                  |                                                                                       |
| 109-1<br>109                                                                                                                                                          | 221051657-45<br>Location: 2nd Fl. / Roof - Built-Up       | No               | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 3.4%                       |                                                           |                  |                                                                                       |
| 109-2<br>109                                                                                                                                                          | 221051657-46<br>Location: 2nd Fl. / Roof - Built-Up       | No               | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 7.6%                       |                                                           |                  |                                                                                       |
| 110-1<br>110                                                                                                                                                          | 221051657-47<br>Location: 2nd Fl. / Roof - Fiberboard     | No               | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21                       |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 60%, Non-fibrous 40%             |                                                           |                  |                                                                                       |

# PLM Bulk Asbestos Report

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| Client No. / HGA                                                                                                                                          | Lab No.                                                                           | Asbestos Present | Total % Asbestos                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 110-2<br>110                                                                                                                                              | 221051657-48<br><b>Location:</b> 2nd Fl. / Roof - Fiberboard                      | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Brown, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 60%, Non-fibrous 40% |                                                                                   |                  |                                                                 |
| 111-1<br>111                                                                                                                                              | 221051657-49<br><b>Location:</b> 2nd Fl. / Roof - Tar Patches                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 12.1%          |                                                                                   |                  |                                                                 |
| 111-2<br>111                                                                                                                                              | 221051657-50<br><b>Location:</b> 2nd Fl. / Roof - Tar Patches                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 11.9%          |                                                                                   |                  |                                                                 |
| 112-1<br>112                                                                                                                                              | 221051657-51<br><b>Location:</b> Roof Above Stairs - Caulk To Parapet             | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 11.3%          |                                                                                   |                  |                                                                 |
| 112-2<br>112                                                                                                                                              | 221051657-52<br><b>Location:</b> Roof Above Stairs - Caulk To Parapet             | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 12.5%          |                                                                                   |                  |                                                                 |
| 113-1<br>113                                                                                                                                              | 221051657-53<br><b>Location:</b> Roof Above Stairs - Vapor Barrier Under Shingles | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.5%           |                                                                                   |                  |                                                                 |

## PLM Bulk Asbestos Report

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| Client No. / HGA                                                                                                                                                    | Lab No.                                                                           | Asbestos Present | Total % Asbestos                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------|
| 113-2<br>113                                                                                                                                                        | 221051657-54<br><b>Location:</b> Roof Above Stairs - Vapor Barrier Under Shingles | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.8%                     |                                                                                   |                  |                                                                          |
| 114-1<br>114                                                                                                                                                        | 221051657-55<br><b>Location:</b> Roof Above Stairs - Shingles                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 37.7%                    |                                                                                   |                  |                                                                          |
| 114-2<br>114                                                                                                                                                        | 221051657-56<br><b>Location:</b> Roof Above Stairs - Shingles                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 35.5%                    |                                                                                   |                  |                                                                          |
| 115-1<br>115                                                                                                                                                        | 221051657-57<br><b>Location:</b> New Offices - Window Caulk                       | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 17.3%                |                                                                                   |                  |                                                                          |
| 115-2<br>115                                                                                                                                                        | 221051657-58<br><b>Location:</b> New Offices - Window Caulk                       | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 29.2%                |                                                                                   |                  |                                                                          |
| 116-1<br>116                                                                                                                                                        | 221051657-59<br><b>Location:</b> 2nd Fl. / Exterior - Stucco                      | <b>Yes</b>       | Trace (<0.25 % pc)<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 100% |                                                                                   |                  |                                                                          |

# PLM Bulk Asbestos Report

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| Client No. / HGA                                                                                                                                                | Lab No.                                                          | Asbestos Present | Total % Asbestos                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------|------------------------------------------------------------|
| 116-2<br>116                                                                                                                                                    | 221051657-60<br><b>Location:</b> 2nd Fl. / Exterior - Stucco     | <b>Yes</b>       | 0.3%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.3 %<br><b>Other Material:</b> Non-fibrous 99.7% |                                                                  |                  |                                                            |
| 116-3<br>116                                                                                                                                                    | 221051657-61<br><b>Location:</b> 2nd Fl. / Exterior - Stucco     | <b>Yes</b>       | 0.5%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.5 %<br><b>Other Material:</b> Non-fibrous 99.5% |                                                                  |                  |                                                            |
| 116-4<br>116                                                                                                                                                    | 221051657-62<br><b>Location:</b> New Bldg. / Exterior - Stucco   | <b>Yes</b>       | 0.5%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.5 %<br><b>Other Material:</b> Non-fibrous 99.5% |                                                                  |                  |                                                            |
| 116-5<br>116                                                                                                                                                    | 221051657-63<br><b>Location:</b> New Bldg. / Exterior - Stucco   | <b>Yes</b>       | 0.5%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.5 %<br><b>Other Material:</b> Non-fibrous 99.5% |                                                                  |                  |                                                            |
| 116-6<br>116                                                                                                                                                    | 221051657-64<br><b>Location:</b> Orig. Bldg. / Exterior - Stucco | <b>Yes</b>       | 0.5%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.5 %<br><b>Other Material:</b> Non-fibrous 99.5% |                                                                  |                  |                                                            |
| 116-7<br>116                                                                                                                                                    | 221051657-65<br><b>Location:</b> New Bay / Exterior - Stucco     | <b>Yes</b>       | 0.8%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.8 %<br><b>Other Material:</b> Non-fibrous 99.2% |                                                                  |                  |                                                            |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                    | Lab No.                                                                    | Asbestos Present | Total % Asbestos                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------|
| 116-8<br>116                                                                                                                                                        | 221051657-66<br><b>Location:</b> New Bay / Exterior - Stucco               | <b>Yes</b>       | 0.3%<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21               |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 0.3 %<br><b>Other Material:</b> Non-fibrous 99.7%     |                                                                            |                  |                                                                          |
| 116-9<br>116                                                                                                                                                        | 221051657-67<br><b>Location:</b> New Bay / Exterior - Stucco               | <b>Yes</b>       | Trace (<0.25 % pc)<br>(ELAP 400 PC)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 100% |                                                                            |                  |                                                                          |
| 117-1<br>117                                                                                                                                                        | 221051657-68<br><b>Location:</b> Throughout Exterior - Green Window Stucco | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Gray/Green, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                                                            |                  |                                                                          |
| 117-2<br>117                                                                                                                                                        | 221051657-69<br><b>Location:</b> Throughout Exterior - Green Window Stucco | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Gray/Green, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                                                            |                  |                                                                          |
| 117-3<br>117                                                                                                                                                        | 221051657-70<br><b>Location:</b> Throughout Exterior - Green Window Stucco | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Gray/Green, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                                                            |                  |                                                                          |
| 118-1<br>118                                                                                                                                                        | 221051657-71<br><b>Location:</b> Meeting Room / Exterior - CMU             | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21          |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%        |                                                                            |                  |                                                                          |

## PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                             | Lab No.                                                                      | Asbestos Present | Total % Asbestos                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 118-2<br>118                                                                                                                                                 | 221051657-72<br><b>Location:</b> Meeting Room / Exterior - CMU               | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                              |                  |                                                                 |
| 119-1<br>119                                                                                                                                                 | 221051657-73<br><b>Location:</b> Meeting Room / Exterior - CMU Mortar        | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                              |                  |                                                                 |
| 119-2<br>119                                                                                                                                                 | 221051657-74<br><b>Location:</b> Meeting Room / Exterior - CMU Mortar        | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                              |                  |                                                                 |
| 120-1<br>120                                                                                                                                                 | 221051657-75<br><b>Location:</b> Meeting Room / Exterior - BlackWindow Caulk | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 4.6%              |                                                                              |                  |                                                                 |
| 120-2<br>120                                                                                                                                                 | 221051657-76<br><b>Location:</b> Meeting Room / Exterior - BlackWindow Caulk | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 3.5%              |                                                                              |                  |                                                                 |
| 121-1<br>121                                                                                                                                                 | 221051657-77<br><b>Location:</b> Meeting Room / Exterior - Silver Door Caulk | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 11.8%              |                                                                              |                  |                                                                 |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                             | Lab No.                                                                      | Asbestos Present | Total % Asbestos                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 121-2<br>121                                                                                                                                                 | 221051657-78<br><b>Location:</b> Meeting Room / Exterior - Silver Door Caulk | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 20.4%              |                                                                              |                  |                                                                 |
| 122-1<br>122                                                                                                                                                 | 221051657-79<br><b>Location:</b> Kitchen / Exterior - Window Caulk           | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 3.1%          |                                                                              |                  |                                                                 |
| 122-2<br>122                                                                                                                                                 | 221051657-80<br><b>Location:</b> Kitchen / Exterior - Window Caulk           | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 9.1%          |                                                                              |                  |                                                                 |
| 123-1<br>123                                                                                                                                                 | 221051657-81<br><b>Location:</b> New Garage - CMU                            | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                              |                  |                                                                 |
| 123-2<br>123                                                                                                                                                 | 221051657-82<br><b>Location:</b> New Garage - CMU                            | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                              |                  |                                                                 |
| 124-1<br>124                                                                                                                                                 | 221051657-83<br><b>Location:</b> New Garage - CMU Mortar                     | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                              |                  |                                                                 |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                             | Lab No.                                  | Asbestos Present | Total % Asbestos                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------|----------------------------------------------------------|
| 124-2                                                                                                                                                        | 221051657-84                             | No               | NAD                                                      |
| 124                                                                                                                                                          | Location: New Garage - CMU Mortar        |                  | (by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                          |                  |                                                          |
| 125-1                                                                                                                                                        | 221051657-85                             | No               | NAD                                                      |
| 125                                                                                                                                                          | Location: Original Bay - Brick           |                  | (by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                          |                  |                                                          |
| 125-2                                                                                                                                                        | 221051657-86                             | No               | NAD                                                      |
| 125                                                                                                                                                          | Location: Original Bay - Brick           |                  | (by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                          |                  |                                                          |
| 126-1                                                                                                                                                        | 221051657-87                             | No               | NAD                                                      |
| 126                                                                                                                                                          | Location: Original Bay - Brick Mortar    |                  | (by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                          |                  |                                                          |
| 126-2                                                                                                                                                        | 221051657-88                             | No               | NAD                                                      |
| 126                                                                                                                                                          | Location: Original Bay - Brick Mortar    |                  | (by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                          |                  |                                                          |
| 127-1                                                                                                                                                        | 221051657-89                             | No               | NAD                                                      |
| 127                                                                                                                                                          | Location: Original Bay - Expansion Joint |                  | (by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.9%               |                                          |                  |                                                          |



## PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                                                | Lab No.                                                                 | Asbestos Present | Total % Asbestos                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 127-2<br>127<br><br><b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 5.1%                              | 221051657-90<br><br><b>Location:</b> Original Bay - Expansion Joint     | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| 128-1<br>128<br><br><b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 48.1%                            | 221051657-91<br><br><b>Location:</b> Parking Lot - Asphalt              | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| 128-2<br>128<br><br><b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 52.6%                            | 221051657-92<br><br><b>Location:</b> Parking Lot - Asphalt              | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| 129-1<br>129<br><br><b>Analyst Description:</b> Gray, Heterogeneous, Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Fibrous glass 5%, Non-fibrous 95% | 221051657-93<br><br><b>Location:</b> Shed On Original Bay - Fake Stucco | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| 129-2<br>129<br><br><b>Analyst Description:</b> Gray, Heterogeneous, Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Fibrous glass 5%, Non-fibrous 95% | 221051657-94<br><br><b>Location:</b> Shed On Original Bay - Fake Stucco | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| 129-3<br>129<br><br><b>Analyst Description:</b> Gray, Heterogeneous, Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Fibrous glass 5%, Non-fibrous 95% | 221051657-95<br><br><b>Location:</b> Shed On Original Bay - Fake Stucco | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |

# PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                             | Lab No.                                                                    | Asbestos Present | Total % Asbestos                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 130-1<br>130                                                                                                                                                 | 221051657-96<br><b>Location:</b> Shed On Original Bay - Glue Dots          | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Green, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 10.3%             |                                                                            |                  |                                                                 |
| 130-2<br>130                                                                                                                                                 | 221051657-97<br><b>Location:</b> Shed On Original Bay - Glue Dots          | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Green, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 11.8%             |                                                                            |                  |                                                                 |
| 131-1<br>131                                                                                                                                                 | 221051657-98<br><b>Location:</b> Shed On Original Bay - Fire Brick         | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                                                            |                  |                                                                 |
| 131-2<br>131                                                                                                                                                 | 221051657-99<br><b>Location:</b> Shed On Original Bay - Fire Brick         | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%  |                                                                            |                  |                                                                 |
| 132-1<br>132                                                                                                                                                 | 221051657-100<br><b>Location:</b> Shed On Original Bay - Fire Brick Mortar | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                            |                  |                                                                 |
| 132-2<br>132                                                                                                                                                 | 221051657-101<br><b>Location:</b> Shed On Original Bay - Fire Brick Mortar | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100% |                                                                            |                  |                                                                 |

## PLM Bulk Asbestos Report

872 Blooming Grove, New Windsor - Entire Firehouse

| Client No. / HGA                                                                                                                                                      | Lab No.                                                     | Asbestos Present | Total % Asbestos                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|------------------------------------------------------------------|
| 133-1<br>133                                                                                                                                                          | 221051657-102<br>Location: Shed On Original Bay - Gap Caulk | Yes              | 2.6%<br>(by NYS ELAP 198.6)<br>by Jared C. Clarke<br>on 05/11/21 |
| <b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 2.6 %<br><b>Other Material:</b> Non-fibrous 19.1% |                                                             |                  |                                                                  |
| 133-2<br>133                                                                                                                                                          | 221051657-103<br>Location: Shed On Original Bay - Gap Caulk |                  | NA/PS                                                            |
| <b>Analyst Description:</b> Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b>                                                                         |                                                             |                  |                                                                  |

### Reporting Notes:

(1) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Jared C. Clarke  
Date: 5/11/2021



Reviewed by: Gabriella Morozov



\*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Motic, Model BA310 Pol Scope, Microscope, Serial #: 1190000326, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

\_\_\_\_\_END OF REPORT\_\_\_\_\_

Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci<br>Sample # | Client Sample#                               | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS | ** Asbestos % by<br>TEM |
|----------------------|----------------------------------------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------|-------------------------|
| 01                   | 87-1                                         | 87         | 0.216                      | 74.1                           | 22.0                           | 3.9                                      | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Vapor Barrier    |            |                            |                                |                                |                                          |                            |                         |
| 02                   | 87-2                                         | 87         | 0.164                      | 75.3                           | 19.9                           | 4.8                                      | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Vapor Barrier    |            |                            |                                |                                |                                          |                            |                         |
| 03                   | 88-1                                         | 88         | 0.374                      | 86.0                           | 3.7                            | 10.3                                     | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Built-Up         |            |                            |                                |                                |                                          |                            |                         |
| 04                   | 88-2                                         | 88         | 0.393                      | 85.1                           | 3.7                            | 11.2                                     | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Built-Up         |            |                            |                                |                                |                                          |                            |                         |
| 05                   | 89-1                                         | 89         | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: New Garage Roof - Fiberboard       |            |                            |                                |                                |                                          |                            |                         |
| 06                   | 89-2                                         | 89         | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: New Garage Roof - Fiberboard       |            |                            |                                |                                |                                          |                            |                         |
| 07                   | 90-1                                         | 90         | 0.116                      | 83.2                           | 3.0                            | 13.8                                     | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Vent Tar         |            |                            |                                |                                |                                          |                            |                         |
| 08                   | 90-2                                         | 90         | 0.164                      | 79.6                           | 6.2                            | 14.2                                     | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Vent Tar         |            |                            |                                |                                |                                          |                            |                         |
| 09                   | 91-1                                         | 91         | 0.235                      | 83.9                           | 6.0                            | 10.1                                     | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Patch Tar        |            |                            |                                |                                |                                          |                            |                         |
| 10                   | 91-2                                         | 91         | 0.205                      | 81.8                           | 5.0                            | 13.2                                     | NAD                        | NAD                     |
|                      | Location: New Garage Roof - Patch Tar        |            |                            |                                |                                |                                          |                            |                         |
| 11                   | 92-1                                         | 92         | 0.262                      | 81.9                           | 6.2                            | 7.1                                      | Chrysotile <0.25           | Chrysotile 4.8          |
|                      | Location: New Garage Roof - Parapet Flashing |            |                            |                                |                                |                                          |                            |                         |
| 12                   | 92-2                                         | 92         | 0.168                      | 87.2                           | 3.7                            | 9.1                                      | Chrysotile <0.25           | NA/PS                   |
|                      | Location: New Garage Roof - Parapet Flashing |            |                            |                                |                                |                                          |                            |                         |
| 13                   | 93-1                                         | 93         | 0.283                      | 86.4                           | 12.5                           | 1.2                                      | NAD                        | NAD                     |
|                      | Location: Orig. Roof Over Lounge -Top Layer  |            |                            |                                |                                |                                          |                            |                         |
| 14                   | 93-2                                         | 93         | 0.266                      | 86.5                           | 12.2                           | 1.3                                      | NAD                        | NAD                     |
|                      | Location: Orig. Roof Over Lounge -Top Layer  |            |                            |                                |                                |                                          |                            |                         |
| 15                   | 94-1                                         | 94         | 0.267                      | 67.4                           | 6.7                            | 20.1                                     | Chrysotile 5.8             | NA                      |
|                      | Location: Orig. Roof Over Lounge -Built-Up   |            |                            |                                |                                |                                          |                            |                         |
| 16                   | 94-2                                         | 94         | 0.592                      | 84.1                           | 4.0                            | 11.9                                     | NA/PS                      | NA                      |
|                      | Location: Orig. Roof Over Lounge -Built-Up   |            |                            |                                |                                |                                          |                            |                         |

Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci<br>Sample # | Client Sample#                                                  | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS | ** Asbestos % by<br>TEM |
|----------------------|-----------------------------------------------------------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------|-------------------------|
| 17                   | 95-1                                                            | 95         | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Orig. Roof Over Lounge -Fiberboard                    |            |                            |                                |                                |                                          |                            |                         |
| 18                   | 95-2                                                            | 95         | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Orig. Roof Over Lounge -Fiberboard                    |            |                            |                                |                                |                                          |                            |                         |
| 19                   | 96-1                                                            | 96         | 0.221                      | 74.9                           | 15.3                           | 9.7                                      | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof - Seam Tar                             |            |                            |                                |                                |                                          |                            |                         |
| 20                   | 96-2                                                            | 96         | 0.161                      | 67.5                           | 18.8                           | 13.7                                     | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof - Seam Tar                             |            |                            |                                |                                |                                          |                            |                         |
| 21                   | 97-1                                                            | 97         | 0.201                      | 82.3                           | 7.5                            | 10.2                                     | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof - Top Of Parapet Tar                   |            |                            |                                |                                |                                          |                            |                         |
| 22                   | 97-2                                                            | 97         | 0.204                      | 82.0                           | 7.2                            | 10.9                                     | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof - Top Of Parapet Tar                   |            |                            |                                |                                |                                          |                            |                         |
| 23                   | 98-1                                                            | 98         | 0.116                      | 84.4                           | 9.4                            | 4.3                                      | Chrysotile <0.25           | Chrysotile 1.9          |
|                      | Location: New Bldg. Roof - Parapet Flashing                     |            |                            |                                |                                |                                          |                            |                         |
| 24                   | 98-2                                                            | 98         | 0.156                      | 80.1                           | 9.0                            | 10.9                                     | Chrysotile <0.25           | NA/PS                   |
|                      | Location: New Bldg. Roof - Parapet Flashing                     |            |                            |                                |                                |                                          |                            |                         |
| 25                   | 99-1                                                            | 99         | 0.187                      | 78.4                           | 7.1                            | 14.5                                     | Chrysotile <0.25           | NA                      |
|                      | Location: New Bldg. Roof - HVAC Flashing                        |            |                            |                                |                                |                                          |                            |                         |
| 26                   | 99-2                                                            | 99         | 0.167                      | 78.1                           | 5.1                            | 14.9                                     | Chrysotile 1.9             | NA                      |
|                      | Location: New Bldg. Roof - HVAC Flashing                        |            |                            |                                |                                |                                          |                            |                         |
| 27                   | 100-1                                                           | 100        | 0.117                      | 79.5                           | 6.8                            | 11.2                                     | Chrysotile 2.5             | NA                      |
|                      | Location: New Bldg. Roof To 2nd Fl. - Parapet Flashing          |            |                            |                                |                                |                                          |                            |                         |
| 28                   | 100-2                                                           | 100        | 0.229                      | 79.3                           | 4.5                            | 16.1                                     | NA/PS                      | NA                      |
|                      | Location: New Bldg. Roof To 2nd Fl. - Parapet Flashing          |            |                            |                                |                                |                                          |                            |                         |
| 29                   | 101-1                                                           | 101        | 0.269                      | 18.9                           | 61.7                           | 19.5                                     | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof To New Garage - Parapet Caulk On Metal |            |                            |                                |                                |                                          |                            |                         |
| 30                   | 101-2                                                           | 101        | 0.167                      | 17.3                           | 62.0                           | 20.7                                     | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof To New Garage - Parapet Caulk On Metal |            |                            |                                |                                |                                          |                            |                         |
| 31                   | 102-1                                                           | 102        | 0.324                      | 87.7                           | 11.9                           | 0.4                                      | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof - Silver Top Layer                     |            |                            |                                |                                |                                          |                            |                         |
| 32                   | 102-2                                                           | 102        | 0.229                      | 85.7                           | 11.6                           | 2.7                                      | NAD                        | NAD                     |
|                      | Location: New Bldg. Roof - Silver Top Layer                     |            |                            |                                |                                |                                          |                            |                         |

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Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci<br>Sample #                       | Client Sample# | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS | ** Asbestos % by<br>TEM |
|--------------------------------------------|----------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------|-------------------------|
| 33                                         | 103-1          | 103        | 0.256                      | 88.8                           | 7.5                            | 3.5                                      | Chrysotile <0.25           | Chrysotile <1.0         |
| Location: New Bldg. Roof - Black 2nd Layer |                |            |                            |                                |                                |                                          |                            |                         |
| 34                                         | 103-2          | 103        | 0.382                      | 89.3                           | 4.6                            | 5.9                                      | Chrysotile <0.25           | Chrysotile <1.0         |
| Location: New Bldg. Roof - Black 2nd Layer |                |            |                            |                                |                                |                                          |                            |                         |
| 35                                         | 104-1          | 104        | 0.531                      | 70.4                           | 5.5                            | 19.0                                     | Chrysotile 5.1             | NA                      |
| Location: New Bldg. Roof - Built-Up        |                |            |                            |                                |                                |                                          |                            |                         |
| 36                                         | 104-2          | 104        | 0.551                      | 71.0                           | 5.1                            | 23.9                                     | NA/PS                      | NA                      |
| Location: New Bldg. Roof - Built-Up        |                |            |                            |                                |                                |                                          |                            |                         |
| 37                                         | 105-1          | 105        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: New Bldg. Roof - Fiberboard      |                |            |                            |                                |                                |                                          |                            |                         |
| 38                                         | 105-2          | 105        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: New Bldg. Roof - Fiberboard      |                |            |                            |                                |                                |                                          |                            |                         |
| 39                                         | 106-1          | 106        | 0.272                      | 81.5                           | 8.5                            | 10.0                                     | NAD                        | NAD                     |
| Location: New Bldg. Roof - Tar Patches     |                |            |                            |                                |                                |                                          |                            |                         |
| 40                                         | 106-2          | 106        | 0.206                      | 82.3                           | 7.7                            | 10.0                                     | NAD                        | NAD                     |
| Location: New Bldg. Roof - Tar Patches     |                |            |                            |                                |                                |                                          |                            |                         |
| 41                                         | 107-1          | 107        | 0.229                      | 87.3                           | 12.0                           | 0.7                                      | NAD                        | NAD                     |
| Location: 2nd Fl. / Roof - 1st Top Silver  |                |            |                            |                                |                                |                                          |                            |                         |
| 42                                         | 107-2          | 107        | 0.237                      | 82.4                           | 12.1                           | 5.5                                      | NAD                        | NAD                     |
| Location: 2nd Fl. / Roof - 1st Top Silver  |                |            |                            |                                |                                |                                          |                            |                         |
| 43                                         | 108-1          | 108        | 0.308                      | 89.6                           | 5.6                            | 4.6                                      | Chrysotile <0.25           | Chrysotile <1.0         |
| Location: 2nd Fl. / Roof - 2nd Top Black   |                |            |                            |                                |                                |                                          |                            |                         |
| 44                                         | 108-2          | 108        | 0.331                      | 90.1                           | 5.6                            | 4.1                                      | Chrysotile <0.25           | Chrysotile <1.0         |
| Location: 2nd Fl. / Roof - 2nd Top Black   |                |            |                            |                                |                                |                                          |                            |                         |
| 45                                         | 109-1          | 109        | 0.353                      | 94.2                           | 2.4                            | 3.4                                      | NAD                        | NAD                     |
| Location: 2nd Fl. / Roof - Built-Up        |                |            |                            |                                |                                |                                          |                            |                         |
| 46                                         | 109-2          | 109        | 0.338                      | 86.7                           | 5.7                            | 7.6                                      | NAD                        | NAD                     |
| Location: 2nd Fl. / Roof - Built-Up        |                |            |                            |                                |                                |                                          |                            |                         |
| 47                                         | 110-1          | 110        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: 2nd Fl. / Roof - Fiberboard      |                |            |                            |                                |                                |                                          |                            |                         |
| 48                                         | 110-2          | 110        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: 2nd Fl. / Roof - Fiberboard      |                |            |                            |                                |                                |                                          |                            |                         |

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Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci<br>Sample # | Client Sample#                                             | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS | ** Asbestos % by<br>TEM |
|----------------------|------------------------------------------------------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------|-------------------------|
| 49                   | 111-1                                                      | 111        | 0.187                      | 80.7                           | 7.2                            | 12.1                                     | NAD                        | NAD                     |
|                      | Location: 2nd Fl. / Roof - Tar Patches                     |            |                            |                                |                                |                                          |                            |                         |
| 50                   | 111-2                                                      | 111        | 0.135                      | 81.2                           | 6.9                            | 11.9                                     | NAD                        | NAD                     |
|                      | Location: 2nd Fl. / Roof - Tar Patches                     |            |                            |                                |                                |                                          |                            |                         |
| 51                   | 112-1                                                      | 112        | 0.210                      | 80.2                           | 8.5                            | 11.3                                     | NAD                        | NAD                     |
|                      | Location: Roof Above Stairs - Caulk To Parapet             |            |                            |                                |                                |                                          |                            |                         |
| 52                   | 112-2                                                      | 112        | 0.234                      | 66.6                           | 20.8                           | 12.5                                     | NAD                        | NAD                     |
|                      | Location: Roof Above Stairs - Caulk To Parapet             |            |                            |                                |                                |                                          |                            |                         |
| 53                   | 113-1                                                      | 113        | 0.068                      | 93.5                           | 5.0                            | 1.5                                      | NAD                        | NAD                     |
|                      | Location: Roof Above Stairs - Vapor Barrier Under Shingles |            |                            |                                |                                |                                          |                            |                         |
| 54                   | 113-2                                                      | 113        | 0.111                      | 93.7                           | 5.5                            | 0.8                                      | NAD                        | NAD                     |
|                      | Location: Roof Above Stairs - Vapor Barrier Under Shingles |            |                            |                                |                                |                                          |                            |                         |
| 55                   | 114-1                                                      | 114        | 0.345                      | 20.5                           | 41.8                           | 37.7                                     | NAD                        | NAD                     |
|                      | Location: Roof Above Stairs - Shingles                     |            |                            |                                |                                |                                          |                            |                         |
| 56                   | 114-2                                                      | 114        | 0.295                      | 18.1                           | 46.4                           | 35.5                                     | NAD                        | NAD                     |
|                      | Location: Roof Above Stairs - Shingles                     |            |                            |                                |                                |                                          |                            |                         |
| 57                   | 115-1                                                      | 115        | 0.189                      | 71.5                           | 11.1                           | 17.3                                     | NAD                        | NAD                     |
|                      | Location: New Offices - Window Caulk                       |            |                            |                                |                                |                                          |                            |                         |
| 58                   | 115-2                                                      | 115        | 0.125                      | 61.5                           | 9.3                            | 29.2                                     | NAD                        | NAD                     |
|                      | Location: New Offices - Window Caulk                       |            |                            |                                |                                |                                          |                            |                         |
| 59                   | 116-1                                                      | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile <0.25           | NA                      |
|                      | Location: 2nd Fl. / Exterior - Stucco                      |            |                            |                                |                                |                                          |                            |                         |
| 60                   | 116-2                                                      | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.3             | NA                      |
|                      | Location: 2nd Fl. / Exterior - Stucco                      |            |                            |                                |                                |                                          |                            |                         |
| 61                   | 116-3                                                      | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.5             | NA                      |
|                      | Location: 2nd Fl. / Exterior - Stucco                      |            |                            |                                |                                |                                          |                            |                         |
| 62                   | 116-4                                                      | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.5             | NA                      |
|                      | Location: New Bldg. / Exterior - Stucco                    |            |                            |                                |                                |                                          |                            |                         |
| 63                   | 116-5                                                      | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.5             | NA                      |
|                      | Location: New Bldg. / Exterior - Stucco                    |            |                            |                                |                                |                                          |                            |                         |
| 64                   | 116-6                                                      | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.5             | NA                      |
|                      | Location: Orig. Bldg. / Exterior - Stucco                  |            |                            |                                |                                |                                          |                            |                         |

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Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci<br>Sample #                                  | Client Sample# | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS | ** Asbestos % by<br>TEM |
|-------------------------------------------------------|----------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------|-------------------------|
| 65                                                    | 116-7          | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.8             | NA                      |
| Location: New Bay / Exterior - Stucco                 |                |            |                            |                                |                                |                                          |                            |                         |
| 66                                                    | 116-8          | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile 0.3             | NA                      |
| Location: New Bay / Exterior - Stucco                 |                |            |                            |                                |                                |                                          |                            |                         |
| 67                                                    | 116-9          | 116        | ----                       | ----                           | ----                           | ----                                     | Chrysotile <0.25           | NA                      |
| Location: New Bay / Exterior - Stucco                 |                |            |                            |                                |                                |                                          |                            |                         |
| 68                                                    | 117-1          | 117        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Throughout Exterior - Green Window Stucco   |                |            |                            |                                |                                |                                          |                            |                         |
| 69                                                    | 117-2          | 117        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Throughout Exterior - Green Window Stucco   |                |            |                            |                                |                                |                                          |                            |                         |
| 70                                                    | 117-3          | 117        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Throughout Exterior - Green Window Stucco   |                |            |                            |                                |                                |                                          |                            |                         |
| 71                                                    | 118-1          | 118        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Meeting Room / Exterior - CMU               |                |            |                            |                                |                                |                                          |                            |                         |
| 72                                                    | 118-2          | 118        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Meeting Room / Exterior - CMU               |                |            |                            |                                |                                |                                          |                            |                         |
| 73                                                    | 119-1          | 119        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Meeting Room / Exterior - CMU Mortar        |                |            |                            |                                |                                |                                          |                            |                         |
| 74                                                    | 119-2          | 119        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
| Location: Meeting Room / Exterior - CMU Mortar        |                |            |                            |                                |                                |                                          |                            |                         |
| 75                                                    | 120-1          | 120        | 0.257                      | 24.8                           | 70.6                           | 4.6                                      | NAD                        | NAD                     |
| Location: Meeting Room / Exterior - BlackWindow Caulk |                |            |                            |                                |                                |                                          |                            |                         |
| 76                                                    | 120-2          | 120        | 0.176                      | 41.2                           | 55.3                           | 3.5                                      | NAD                        | NAD                     |
| Location: Meeting Room / Exterior - BlackWindow Caulk |                |            |                            |                                |                                |                                          |                            |                         |
| 77                                                    | 121-1          | 121        | 0.155                      | 61.6                           | 26.6                           | 11.8                                     | NAD                        | NAD                     |
| Location: Meeting Room / Exterior - Silver Door Caulk |                |            |                            |                                |                                |                                          |                            |                         |
| 78                                                    | 121-2          | 121        | 0.174                      | 52.5                           | 27.2                           | 20.4                                     | NAD                        | NAD                     |
| Location: Meeting Room / Exterior - Silver Door Caulk |                |            |                            |                                |                                |                                          |                            |                         |
| 79                                                    | 122-1          | 122        | 0.207                      | 21.8                           | 75.0                           | 3.1                                      | NAD                        | NAD                     |
| Location: Kitchen / Exterior - Window Caulk           |                |            |                            |                                |                                |                                          |                            |                         |
| 80                                                    | 122-2          | 122        | 0.230                      | 22.5                           | 68.4                           | 9.1                                      | NAD                        | NAD                     |
| Location: Kitchen / Exterior - Window Caulk           |                |            |                            |                                |                                |                                          |                            |                         |



Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci<br>Sample # | Client Sample#                               | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS | ** Asbestos % by<br>TEM |
|----------------------|----------------------------------------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------|-------------------------|
| 81                   | 123-1                                        | 123        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: New Garage - CMU                   |            |                            |                                |                                |                                          |                            |                         |
| 82                   | 123-2                                        | 123        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: New Garage - CMU                   |            |                            |                                |                                |                                          |                            |                         |
| 83                   | 124-1                                        | 124        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: New Garage - CMU Mortar            |            |                            |                                |                                |                                          |                            |                         |
| 84                   | 124-2                                        | 124        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: New Garage - CMU Mortar            |            |                            |                                |                                |                                          |                            |                         |
| 85                   | 125-1                                        | 125        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Original Bay - Brick               |            |                            |                                |                                |                                          |                            |                         |
| 86                   | 125-2                                        | 125        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Original Bay - Brick               |            |                            |                                |                                |                                          |                            |                         |
| 87                   | 126-1                                        | 126        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Original Bay - Brick Mortar        |            |                            |                                |                                |                                          |                            |                         |
| 88                   | 126-2                                        | 126        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Original Bay - Brick Mortar        |            |                            |                                |                                |                                          |                            |                         |
| 89                   | 127-1                                        | 127        | 0.270                      | 19.8                           | 79.4                           | 0.9                                      | NAD                        | NAD                     |
|                      | Location: Original Bay - Expansion Joint     |            |                            |                                |                                |                                          |                            |                         |
| 90                   | 127-2                                        | 127        | 0.269                      | 19.0                           | 75.9                           | 5.1                                      | NAD                        | NAD                     |
|                      | Location: Original Bay - Expansion Joint     |            |                            |                                |                                |                                          |                            |                         |
| 91                   | 128-1                                        | 128        | 0.340                      | 6.1                            | 45.8                           | 48.1                                     | NAD                        | NAD                     |
|                      | Location: Parking Lot - Asphalt              |            |                            |                                |                                |                                          |                            |                         |
| 92                   | 128-2                                        | 128        | 0.515                      | 7.4                            | 40.0                           | 52.6                                     | NAD                        | NAD                     |
|                      | Location: Parking Lot - Asphalt              |            |                            |                                |                                |                                          |                            |                         |
| 93                   | 129-1                                        | 129        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Shed On Original Bay - Fake Stucco |            |                            |                                |                                |                                          |                            |                         |
| 94                   | 129-2                                        | 129        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Shed On Original Bay - Fake Stucco |            |                            |                                |                                |                                          |                            |                         |
| 95                   | 129-3                                        | 129        | ----                       | ----                           | ----                           | ----                                     | NAD                        | NA                      |
|                      | Location: Shed On Original Bay - Fake Stucco |            |                            |                                |                                |                                          |                            |                         |
| 96                   | 130-1                                        | 130        | 0.173                      | 24.3                           | 65.4                           | 10.3                                     | NAD                        | NAD                     |
|                      | Location: Shed On Original Bay - Glue Dots   |            |                            |                                |                                |                                          |                            |                         |

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Client Name: H2M Group

**Table I**  
**Summary of Bulk Asbestos Analysis Results**  
 872 Blooming Grove, New Windsor - Entire Firehouse

| AmeriSci Sample #                                  | Client Sample# | HG Area | Sample Weight (gram) | Heat Sensitive Organic % | Acid Soluble Inorganic % | Insoluble Non-Asbestos Inorganic % | ** Asbestos % by PLM/DS | ** Asbestos % by TEM |
|----------------------------------------------------|----------------|---------|----------------------|--------------------------|--------------------------|------------------------------------|-------------------------|----------------------|
| 97                                                 | 130-2          | 130     | 0.143                | 27.7                     | 60.5                     | 11.8                               | NAD                     | NAD                  |
| Location: Shed On Original Bay - Glue Dots         |                |         |                      |                          |                          |                                    |                         |                      |
| 98                                                 | 131-1          | 131     | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Shed On Original Bay - Fire Brick        |                |         |                      |                          |                          |                                    |                         |                      |
| 99                                                 | 131-2          | 131     | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Shed On Original Bay - Fire Brick        |                |         |                      |                          |                          |                                    |                         |                      |
| 100                                                | 132-1          | 132     | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Shed On Original Bay - Fire Brick Mortar |                |         |                      |                          |                          |                                    |                         |                      |
| 101                                                | 132-2          | 132     | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Shed On Original Bay - Fire Brick Mortar |                |         |                      |                          |                          |                                    |                         |                      |
| 102                                                | 133-1          | 133     | 0.259                | 37.1                     | 41.2                     | 19.1                               | Chrysotile 2.6          | NA                   |
| Location: Shed On Original Bay - Gap Caulk         |                |         |                      |                          |                          |                                    |                         |                      |
| 103                                                | 133-2          | 133     | 0.237                | 37.8                     | 40.6                     | 21.6                               | NA/PS                   | NA                   |
| Location: Shed On Original Bay - Gap Caulk         |                |         |                      |                          |                          |                                    |                         |                      |

Analyzed by: Gabriella Morozov

Date: 5/12/2021



Reviewed by: Gabriella Morozov



\*\*Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

PCB - 1  
Paint - 16  
#3 NO.  
39 Friable  
64 NOB

H2M architects + engineers

Bulk Sheet and Chain of Custody

Page 1 OF 4

|                                                                           |                                                 |                                             |
|---------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------|
| H2M L50                                                                   | Site Address<br>872 Blooming Grove, New Windsor | Date Submitted:<br>5-4-21                   |
| Address:<br>538 Broad Hollow Road<br>4th Floor East<br>Melville, NY 11747 | Work Area<br>Entire Firehouse                   | Turn Around Time:<br>1 week                 |
|                                                                           | Fax Results to:                                 | E-mail Results to:<br>KVanderSchuyt@H2M.com |
|                                                                           |                                                 | Number of Samples:<br>103                   |

|                                       |                                         |                                          |                               |                       |
|---------------------------------------|-----------------------------------------|------------------------------------------|-------------------------------|-----------------------|
| Analytical Procedure:<br>(Circle One) | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY) | NY ELAP Method 198.4<br>(TEM) | Billing #<br>VGFD 200 |
|---------------------------------------|-----------------------------------------|------------------------------------------|-------------------------------|-----------------------|

| Sample Number | Location              | Sample Description | Comments |
|---------------|-----------------------|--------------------|----------|
| 87 - 1        | New Garage Roof       | Vapor Barrier      |          |
| 87 - 2        |                       | 1                  |          |
| 88 - 1        |                       | Built Up           |          |
| 88 - 2        |                       | 1                  |          |
| 89 - 1        |                       | Fiberboard         |          |
| 89 - 2        |                       | 1                  |          |
| 90 - 1        |                       | Vent Tar           |          |
| 90 - 2        |                       | 1                  |          |
| 91 - 1        |                       | Patch Tar          |          |
| 91 - 2        |                       | 1                  |          |
| 92 - 1        |                       | Parapet Flashing   |          |
| 92 - 2        |                       | 1                  |          |
| 93 - 1        | Orig Roof Over Lounge | Top Layer          |          |
| 93 - 2        |                       | 1                  |          |
| 94 - 1        |                       | Built up           |          |
| 94 - 2        |                       | 1                  |          |
| 95 - 1        |                       | Fiber board        |          |
| 95 - 2        |                       | 1                  |          |
| 96 - 1        | New Bldg Roof         | Seam Tar           |          |
| 96 - 2        |                       | 1                  |          |
| 97 - 1        |                       | Top of Parapet Tar |          |
| 97 - 2        |                       | 1                  |          |
| 98 - 1        |                       | Parapet Flashing   |          |
| 98 - 2        |                       | 1                  |          |
| 99 - 1        |                       | HVAC Flashing      |          |
| 99 - 2        |                       | 1                  |          |

|                                 |                |      |                             |                |           |
|---------------------------------|----------------|------|-----------------------------|----------------|-----------|
| Relinquished by (signature)<br> | Date<br>5-4-21 | Time | Received by (signature)<br> | Date<br>5/7/21 | Agent of: |
| Relinquished by (signature)     | Date           | Time | Received by (signature)     | Date<br>11/30  | Agent of: |

STOP AT FIRST POSITIVE!!!

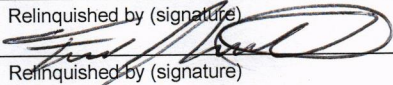
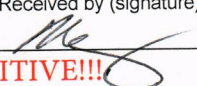


| <b>H2M L50</b>                                                                        |                             | Site Address                            |                                             | Date Submitted:               |                |           |
|---------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------|---------------------------------------------|-------------------------------|----------------|-----------|
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |                             | Work Area                               |                                             | Turn Around Time:             |                |           |
|                                                                                       |                             | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.com | Number of Samples:            |                |           |
| Analytical Procedure:<br>(Circle One)                                                 |                             | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM) | Billing #      |           |
| Sample Number                                                                         | Location                    | Sample Description                      |                                             | Comments                      |                |           |
| 100 - 1                                                                               | New Bldg Roof to 2nd flr    | Parapet, Flashing                       |                                             |                               |                |           |
| 100 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 101 - 1                                                                               | New Bldg Roof to New Garage | Parapet Caulk on metal                  |                                             |                               |                |           |
| 101 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 102 - 1                                                                               | New Bldg Roof               | Silver Top Layer                        |                                             |                               |                |           |
| 102 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 103 - 1                                                                               |                             | Black 2nd Layer                         |                                             |                               |                |           |
| 103 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 104 - 1                                                                               |                             | Built up                                |                                             |                               |                |           |
| 104 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 105 - 1                                                                               |                             | Fiberboard                              |                                             |                               |                |           |
| 105 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 106 - 1                                                                               |                             | Tar Patches                             |                                             |                               |                |           |
| 106 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 107 - 1                                                                               | 2nd Floor Roof              | 1st Top Silver                          |                                             |                               |                |           |
| 107 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 108 - 1                                                                               |                             | 2nd Top Black                           |                                             |                               |                |           |
| 108 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 109 - 1                                                                               |                             | Built up                                |                                             |                               |                |           |
| 109 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 110 - 1                                                                               |                             | Fiber board                             |                                             |                               |                |           |
| 110 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 111 - 1                                                                               |                             | Tar Patches                             |                                             |                               |                |           |
| 111 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| 112 - 1                                                                               | Roof Above Stairs           | Caulk to parapet                        |                                             |                               |                |           |
| 112 - 2                                                                               |                             |                                         |                                             |                               |                |           |
| Relinquished by (signature)                                                           |                             | Date<br>5-4-21                          | Time                                        | Received by (signature)       | Date           | Agent of: |
| Relinquished by (signature)                                                           |                             | Date                                    | Time                                        | Received by (signature)       | Date<br>5/7/21 | Agent of: |

221051657

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1120

| <b>H2M L50</b>                                                                        |                       | Site Address                            |                                             | Date Submitted:                                                                      |           |           |
|---------------------------------------------------------------------------------------|-----------------------|-----------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------------|-----------|-----------|
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 |                       | Work Area                               |                                             | Turn Around Time:                                                                    |           |           |
|                                                                                       |                       | Fax Results to:                         | E-mail Results to:<br>KVanderSchuyt@H2M.com | Number of Samples:                                                                   |           |           |
| Analytical Procedure:<br>(Circle One)                                                 |                       | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY)    | NY ELAP Method 198.4<br>(TEM)                                                        | Billing # |           |
| Sample Number                                                                         | Location              | Sample Description                      |                                             | Comments                                                                             |           |           |
| 113 - 1                                                                               | Roof above Stairs     | Vapor Barrier under Shingles            |                                             |                                                                                      |           |           |
| 113 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 114 - 1                                                                               |                       | Shingles                                |                                             |                                                                                      |           |           |
| 114 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 115 - 1                                                                               | New Offices           | Window Caulk                            |                                             |                                                                                      |           |           |
| 115 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 116 - 1                                                                               | 2nd Floor Exterior    | Stucco                                  |                                             |                                                                                      |           |           |
| 116 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 116 - 3                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 116 - 4                                                                               | New Bldg              |                                         |                                             |                                                                                      |           |           |
| 116 - 5                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 116 - 6                                                                               | Orig Bldg             |                                         |                                             |                                                                                      |           |           |
| 116 - 7                                                                               | New Bay               |                                         |                                             |                                                                                      |           |           |
| 116 - 8                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 116 - 9                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 117 - 1                                                                               | Throughout Exterior   | Green Window Stucco                     |                                             |                                                                                      |           |           |
| 117 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 117 - 3                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 118 - 1                                                                               | Meeting Room Exterior | CMU                                     |                                             |                                                                                      |           |           |
| 118 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 119 - 1                                                                               |                       | Mortar                                  |                                             |                                                                                      |           |           |
| 119 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 120 - 1                                                                               |                       | Black Window Caulk                      |                                             |                                                                                      |           |           |
| 120 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| 121 - 1                                                                               |                       | Silver Door Caulk                       |                                             |                                                                                      |           |           |
| 121 - 2                                                                               |                       |                                         |                                             |                                                                                      |           |           |
| Relinquished by (signature)                                                           |                       | Date                                    | Time                                        | Received by (signature)                                                              | Date      | Agent of: |
|    |                       | 5-4-21                                  |                                             |  | 5/7/21    |           |
| Relinquished by (signature)                                                           |                       | Date                                    | Time                                        | Received by (signature)                                                              | Date      | Agent of: |

#221051657

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|                                                                                       |                 |                                             |                    |
|---------------------------------------------------------------------------------------|-----------------|---------------------------------------------|--------------------|
| <b>H2M L50</b>                                                                        | Site Address    |                                             | Date Submitted:    |
| Address:<br>538 Broad Hollow Road<br>4 <sup>th</sup> Floor East<br>Melville, NY 11747 | Work Area       |                                             | Turn Around Time:  |
|                                                                                       | Fax Results to: | E-mail Results to:<br>KVanderSchuyt@H2M.com | Number of Samples: |

|                                       |                                         |                                          |                               |
|---------------------------------------|-----------------------------------------|------------------------------------------|-------------------------------|
| Analytical Procedure:<br>(Circle One) | NY ELAP Method 198.1<br>(friable in NY) | NY ELAP Method 198.6<br>(non-friable-NY) | NY ELAP Method 198.4<br>(TEM) |
|---------------------------------------|-----------------------------------------|------------------------------------------|-------------------------------|

Billing #

| Sample Number | Location             | Sample Description | Comments   |
|---------------|----------------------|--------------------|------------|
| 122 - 1       | Kitchen Exterior     | Window Caulk       |            |
| 122 - 2       |                      |                    |            |
| 123 - 1       | New Garage           | CMU                |            |
| 123 - 2       |                      |                    |            |
| 124 - 1       |                      | Mortar             |            |
| 124 - 2       |                      |                    |            |
| 125 - 1       | Original Bay         | Brick              |            |
| 125 - 2       |                      |                    |            |
| 126 - 1       |                      | Mortar             |            |
| 126 - 2       |                      |                    |            |
| 127 - 1       |                      | Expansion Joint    |            |
| 127 - 2       |                      |                    |            |
| 128 - 1       | Parking Lot          | Asphalt            |            |
| 128 - 2       |                      |                    |            |
| 129 - 1       | Shed on Original Bay | Fake Stucco        |            |
| 129 - 2       |                      |                    |            |
| 129 - 3       |                      |                    |            |
| 130 - 1       |                      | Glow Dots          | (Interior) |
| 130 - 2       |                      |                    |            |
| 131 - 1       |                      | Fire Brick         |            |
| 131 - 2       |                      |                    |            |
| 132 - 1       |                      | Mortar             |            |
| 132 - 2       |                      |                    |            |
| 133 - 1       |                      | Gap Caulk          |            |
| 133 - 2       |                      |                    |            |

#221051657

|                             |                |      |                         |                |           |
|-----------------------------|----------------|------|-------------------------|----------------|-----------|
| Relinquished by (signature) | Date<br>5-4-21 | Time | Received by (signature) | Date<br>5/7/21 | Agent of: |
| Relinquished by (signature) | Date           | Time | Received by (signature) | Date           | Agent of: |

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1130



## **ATTACHMENT 2**

H2M'S PERSONNEL LICENSES AND CERTIFICATIONS

**New York State – Department of Labor**

Division of Safety and Health  
License and Certificate Unit  
State Campus, Building 12  
Albany, NY 12240

**ASBESTOS HANDLING LICENSE**

H2M Architects, Engineers, Land Surveying and  
Landscape Architecture, D.P.C.  
4th Floor East  
538 Broad Hollow Road  
Melville, NY 11747

FILE NUMBER: 00-0724  
LICENSE NUMBER: 28582  
LICENSE CLASS: RESTRICTED  
DATE OF ISSUE: 12/11/2020  
EXPIRATION DATE: 12/31/2021

Duly Authorized Representative – Debra Mattina:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.


This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director  
For the Commissioner of Labor




NYC DEP ASBESTOS CONTROL PROGRAM  
ASBESTOS CERTIFICATE




**MILNE,**  
DOUGLAS  
INVESTIGATOR  
160491

EXPIRES: 02/12/2023  
DOB: 02/12/1994 M 6' 02"

**MUST BE CARRIED ON ALL ASBESTOS PROJECTS**




STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE



**DOUGLAS B MILNE**  
CLASS(EXPIRES)  
C ATEC(02/21) D INSP(02/21)  
H PM (02/21)

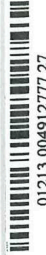
**CERT# 13-14307**  
**DMV# 316381023**

**MUST BE CARRIED ON ASBESTOS PROJECTS**



**DMV ID: 316381023**

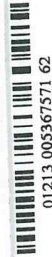
This certificate must be shown to a  
NYCDEP representative upon request.  
Report loss immediately to NYCDEP  
Asbestos Control Program, 8th floor  
59-17 Junction Blvd., Flushing, NY 11373



01213 004912777 27



IF FOUND RETURN TO:  
NYSDEL - L&C UNIT  
ROOM 161A BUILDING 12  
STATE OFFICE CAMPUS  
ALBANY NY 12240

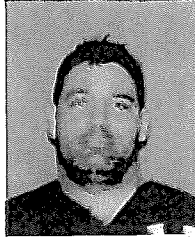


01213 005367571 62

EYES BLU  
HAIR BLN  
HGT 6' 03"

STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE

JULY 9



FRANK J ACCIARITO

CLASS(EXPIRES)

C ATEC(07/21) D INSP(07/21)

H PM (07/21)

CERT# 18-63276

DL# 860811396

MUST BE CARRIED ON ASBESTOS PROJECTS

NYSDOL/STATE OF NEW YORK DEPARTMENT OF LABOR



IF FOUND RETURN TO:

NYSDOL - L&C UNIT

ROOM 161A BUILDING 12

STATE OFFICE CAMPUS

ALBANY NY 12240

EYES HAZ

HAIR BLK

HGT 5' 08"

01213 005370354 28



**ATTACHMENT 3**

EMSL'S CERTIFICATIONS



ANDREW M. CUOMO  
Governor

## Department of Health

HOWARD A. ZUCKER, M.D., J.D.  
Commissioner

LISA J. PINO, M.A., J.D.  
Executive Deputy Commissioner

LAB ID: 11480

April 01, 2021

MR. PAUL J. MUCHA  
AMERICA SCIENCE TEAM NEW YORK, INC  
117 EAST 30TH ST  
NEW YORK, NY 10016

Certificate Expiration Date:  
April 01, 2022

Dear Mr. Mucha,

Enclosed are certificate(s) of approval issued to your environmental laboratory for the current permit year. The certificate(s) supersede(s) any previously issued one(s) and is(are) in effect through the expiration date listed. Please carefully examine the certificate(s) to insure that the categories, subcategories, analytes, and methods for which your laboratory is approved are correct. In addition, verify that your laboratory's name, address, lead technical director, and identification number are accurate.

Pursuant to NYCRR Subpart 55-2.2, original certificates must be posted conspicuously in the laboratory and copies shall be made available to any client of the laboratory upon request.

Pursuant to NYCRR Subpart 55-2.6, any misrepresentation of the fields of accreditation (category - method - analyte) for which your laboratory is approved may result in denial, suspension, or revocation of your certification. Any use of the Environmental Laboratory Approval Program (ELAP) or National Environmental Laboratory Accreditation Program (NELAP) name, reference to the laboratory's approval status, and/or using the NELAP logo in any catalogs, advertising, business solicitations, proposals, quotations, laboratory analytical reports, or other materials must include the laboratory's ELAP identification number and distinguish between testing for which the laboratory is approved and testing for which the laboratory is not approved.

If you have any questions, please contact us at the Environmental Laboratory Approval Program, Wadsworth Center, New York State Department of Health, Empire State Plaza, Albany NY, 12237; by phone at (518) 485-5570; by facsimile at (518) 485-5568; and by email at [elap@health.ny.gov](mailto:elap@health.ny.gov).

Sincerely,

Victoria Pretti  
Director and QA Officer  
Environmental Laboratory Approval Program

NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



Expires 12:01 AM April 01, 2022  
Issued April 01, 2021

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. PAUL J. MUCHA  
AMERICA SCIENCE TEAM NEW YORK, INC  
117 EAST 30TH ST  
NEW YORK, NY 10016

NY Lab Id No: 11480

*is hereby APPROVED as an Environmental Laboratory in conformance with the  
National Environmental Laboratory Accreditation Conference Standards (2016) for the category  
ENVIRONMENTAL ANALYSES POTABLE WATER  
All approved analytes are listed below:*

**Miscellaneous**

Asbestos

EPA 100.2

Serial No.: 62999

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.



NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



Expires 12:01 AM April 01, 2022  
Issued April 01, 2021

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. PAUL J. MUCHA  
AMERICA SCIENCE TEAM NEW YORK, INC  
117 EAST 30TH ST  
NEW YORK, NY 10016

NY Lab Id No: 11480

*is hereby APPROVED as an Environmental Laboratory for the category  
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE  
All approved subcategories and/or analytes are listed below:*

**Miscellaneous**

|                                      |                                           |
|--------------------------------------|-------------------------------------------|
| Asbestos in Friable Material         | Item 198.1 of Manual<br>EPA 600/M4/82/020 |
| Asbestos in Non-Friable Material-PLM | Item 198.6 of Manual (NOB by PLM)         |
| Asbestos in Non-Friable Material-TEM | Item 198.4 of Manual                      |

Serial No.: 63000

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



Expires 12:01 AM April 01, 2022  
Issued April 01, 2021

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. PAUL J. MUCHA  
AMERICA SCIENCE TEAM NEW YORK, INC  
117 EAST 30TH ST  
NEW YORK, NY 10016

NY Lab Id No: 11480

*is hereby APPROVED as an Environmental Laboratory for the category  
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS  
All approved subcategories and/or analytes are listed below:*

**Miscellaneous**

Asbestos

40 CFR 763 APX A No. III  
YAMATE, AGARWAL GIBB  
NIOSH 7402

Fibers

NIOSH 7400 A RULES

Serial No.: 63001

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017**

**AmeriSci New York**

117 E. 30th Street

New York, NY 10016

Mr. Paul Mucha

Phone: 212-679-8600 Fax: 212-679-2711

Email: [pmucha@amerisci.com](mailto:pmucha@amerisci.com)

<http://www.amerisci.com>

**ASBESTOS FIBER ANALYSIS**

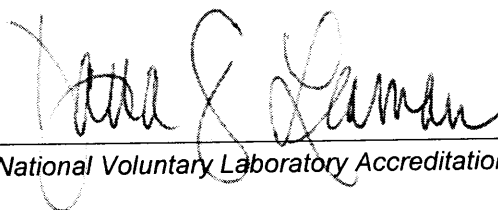
**NVLAP LAB CODE 200546-0**

**Bulk Asbestos Analysis**

| <b><u>Code</u></b> | <b><u>Description</u></b>                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 18/A01             | EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples |
| 18/A03             | EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials                                         |

**Airborne Asbestos Analysis**

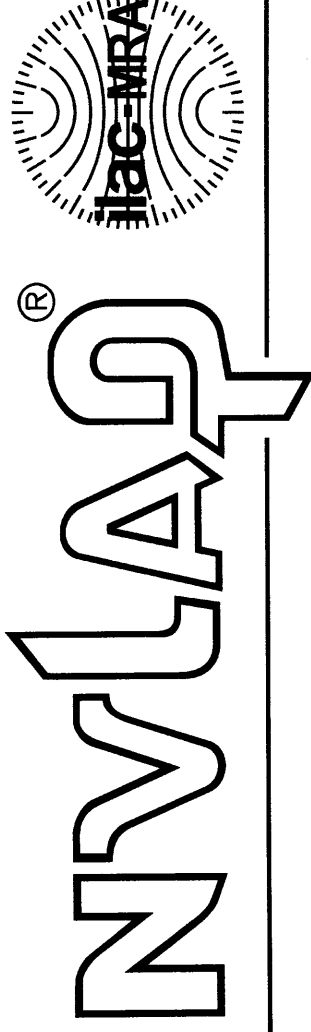
| <b><u>Code</u></b> | <b><u>Description</u></b>                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18/A02             | U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A. |



*For the National Voluntary Laboratory Accreditation Program*



United States Department of Commerce  
National Institute of Standards and Technology



---

# Certificate of Accreditation to ISO/IEC 17025:2017

---

NVLAP LAB CODE: 200546-0

**AmeriSci New York**

New York, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:

## Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).

---

2020-07-01 through 2021-06-30

Effective Dates



A handwritten signature in black ink, appearing to read "Peter J. Langan".

For the National Voluntary Laboratory Accreditation Program

United States Department of Commerce  
National Institute of Standards and Technology



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## Certificate of Accreditation to ISO/IEC 17025:2017

---

NVLAP LAB CODE: 101048-10

**EMSL Analytical, Inc.**  
Carle Place, NY

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

### **Asbestos Fiber Analysis**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

---

2020-07-01 through 2021-06-30

*Effective Dates*



A handwritten signature in black ink, which appears to read "Peter S. Herman".

---

*For the National Voluntary Laboratory Accreditation Program*

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017**

**EMSL Analytical, Inc.**

528 Mineola Ave.

Carle Place, NY 11514

Daniel Clarke

Phone: 516-997-7251

Email: dclarke@emsl.com

<http://www.emsl.com>

**ASBESTOS FIBER ANALYSIS**

**NVLAP LAB CODE 101048-10**

**Bulk Asbestos Analysis**

**Code**

**Description**

18/A01

EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

18/A03

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

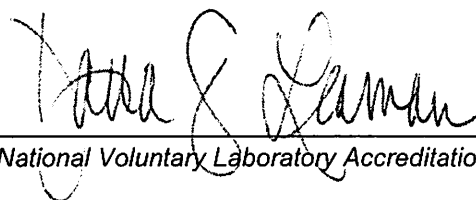
**Airborne Asbestos Analysis**

**Code**

**Description**

18/A02

U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.



*For the National Voluntary Laboratory Accreditation Program*



NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



Expires 12:01 AM April 01, 2022  
Issued April 01, 2021

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. DANIEL CLARKE  
EMSL ANALYTICAL, INC.  
528 MINEOLA AVE.  
CARLE PLACE, NY 11514

NY Lab Id No: 11469

*is hereby APPROVED as an Environmental Laboratory for the category  
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE  
All approved subcategories and/or analytes are listed below:*

**Miscellaneous**

|                                          |                                           |
|------------------------------------------|-------------------------------------------|
| Asbestos in Friable Material             | Item 198.1 of Manual<br>EPA 600/M4/82/020 |
| Asbestos in Non-Friable Material-PLM     | Item 198.6 of Manual (NOB by PLM)         |
| Asbestos in Non-Friable Material-TEM     | Item 198.4 of Manual                      |
| Asbestos-Vermiculite-Containing Material | Item 198.8 of Manual                      |
| Lead in Paint                            | EPA 7000B                                 |

**Sample Preparation Methods**

EPA 3051A

NEW YORK  
STATE OF  
OPPORTUNITY

Department  
of Health

Serial No.: 62996

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.



NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



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528 MINEOLA AVE.  
CARLE PLACE, NY 11514

NY Lab Id No: 11469

*is hereby APPROVED as an Environmental Laboratory in conformance with the  
National Environmental Laboratory Accreditation Conference Standards (2016) for the category  
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS  
All approved analytes are listed below:*

**Miscellaneous**

Particulate Matter

40 CFR PART 50 APP B



Department  
of Health

Serial No.: 62997

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WADSWORTH CENTER



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ENVIRONMENTAL ANALYSES AIR AND EMISSIONS  
All approved subcategories and/or analytes are listed below:*

**Metals I**

Lead, Total NIOSH 7082

**Miscellaneous**

Asbestos 40 CFR 763 APX A No. III

YAMATE, AGARWAL GIBB

NIOSH 7402

**Fibers**

NIOSH 7400 A RULES

NEW YORK  
STATE OF  
OPPORTUNITY

Department  
of Health

**Serial No.: 62998**

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**ATTACHMENT 4**

PHOTOGRAPHIC DOCUMENTATION



Vails Gate Fire Department



2<sup>nd</sup> Floor: Asbestos containing 12"x12" white and gray floor tile.





**2<sup>nd</sup> Floor: Asbestos containing wall joint compound and wall gypsum board.**



**2<sup>nd</sup> Floor: Asbestos containing 12"x12" tan vinyl floor tile.**



2<sup>nd</sup> Floor, Bathroom: Non-asbestos containing wall tile grout, wall tile glue, floor tile grout, floor tile glue, and 2'x2' old ceiling tiles.



Office Add-Ons to Original Bay: Non-asbestos containing 12"x12" White with Blue floor tile and associated mastic, blue cove base and mastic, and 1'x1' Ceiling Tile spline.

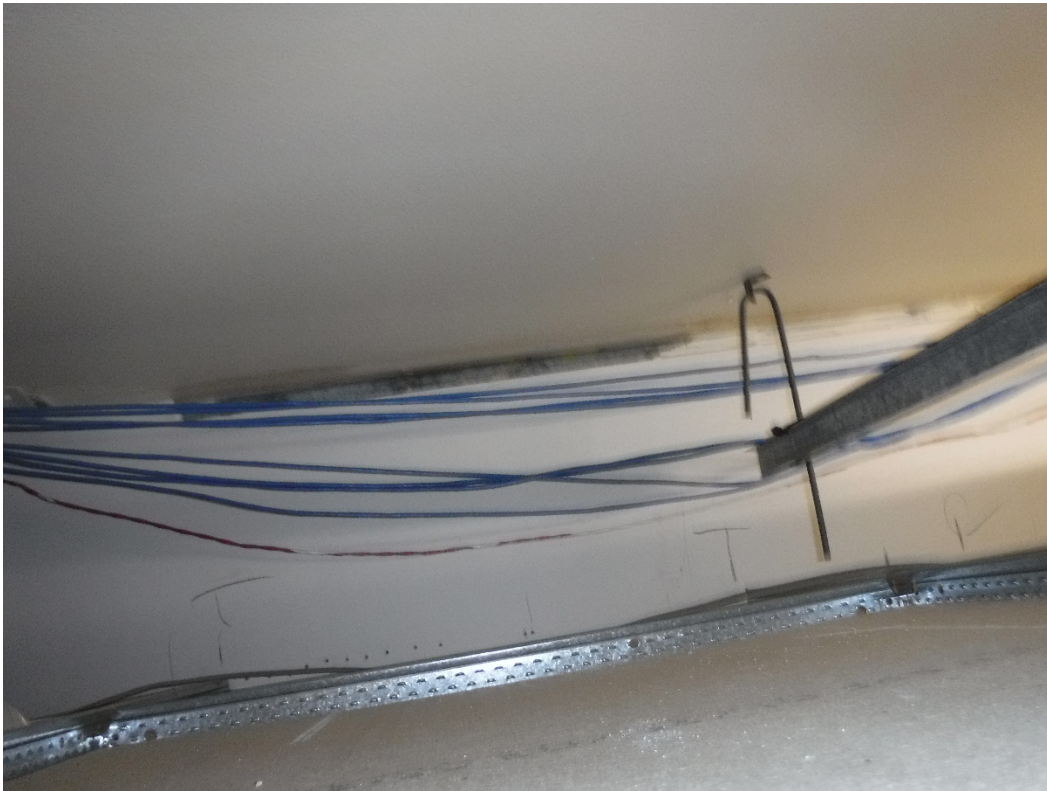




Office Add-ons to Original Bay: Non-asbestos containing wall gypsum board, joint compound, ceiling gypsum board, joint compound, and epoxy floor.



Original Building: Asbestos containing ceiling gypsum board and joint compound.



**Original Building Lounge/Office/Hallway/Bathrooms: Asbestos containing Ceiling Gypsum Board and ceiling joint compound above ceiling tile.**



**Original Building Office/Lounge: Non-asbestos containing 12"x12" vinyl floor tiles white with blue streaks.**





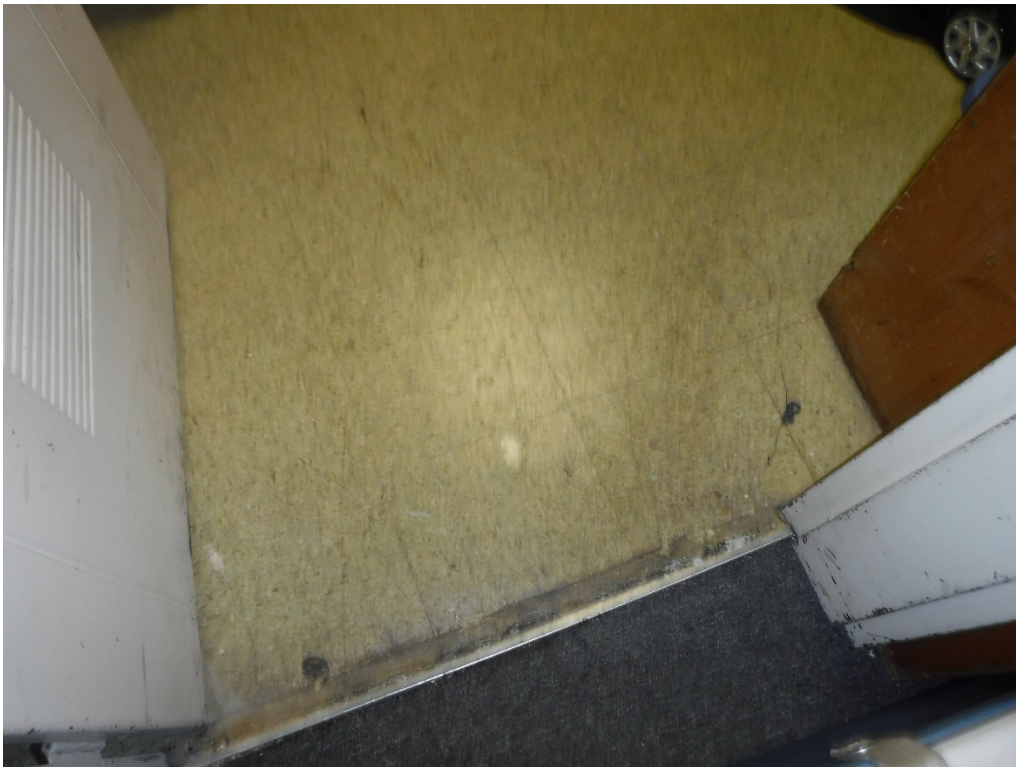
Lounge/Lobby New Building: Non-asbestos containing ceramic stone tile mortar and setting bed.



Boiler Room: Asbestos containing transite ceiling.



Boiler Room: Non-asbestos containing fire stop mortar, chimney flu caulk, and window caulk.



Bar Storage: Asbestos containing 12"x12" vinyl floor tile yellow and associated mastic.





**Bar Storage: Asbestos containing black cove base and mastic.**



**Meeting Room: Asbestos containing pipe insulation (above soffit ceiling).**



Women's Bathroom: Non-asbestos containing wall tile grout and glue, floor tile grout, glue, and setting bed, and wallboard behind tiles.



Men's Bathroom: Non-asbestos containing wall tile grout and glue, floor tile grout, glue, and setting bed.





Kitchen and Bathroom: Non-asbestos containing ceiling gypsum board and joint compound above drop ceiling. Non-asbestos containing floor tile grout and mud.



New Bay: Non-asbestos containing foam mastic around door.





New Bay Roof: Non-asbestos containing roof vapor barrier, built-up, and fiberboard.



New Bay Roof: Non-asbestos containing vent tar and patch tar.





**New Bay Roof: Asbestos containing parapet flashing.**



**Original Building Roof (Roof over Lounge): Asbestos containing built-up layer.**





New Building Exterior Roof: Non-asbestos containing silver top layer, black 2<sup>nd</sup> layer, fiberboard, and tar patches. **Asbestos containing built-up layer.**



New Building Exterior Roof: **Asbestos containing HVAC flashing, and parapet flashing.**  
Non-asbestos containing seam tar, top of parapet tar.





2<sup>nd</sup> Floor Roof: Non-asbestos containing silver top layer, black second layer, built-up, fiberboard, tar patches.



Roof above Stairs: Non-asbestos containing caulk to parapet, vapor barrier under shingles, shingles, and window caulk.



2<sup>nd</sup> Floor/ New Building/ Original Building/ New Bay: Non-asbestos containing stucco, green window stucco, and asphalt.



Attached shed: Asbestos containing gap caulk.





**Meeting Room: Asbestos containing vinyl floor tile (bottom layer) and associated mastic.**