architects + engineers



PROJECT MANUAL

THIELLS-ROSEVILLE FIRE DISTRICT

99 West Ramapo Road Garnerville, New York 10923

NEW 26-100 FIRE HEADQUARTERS

65 W Ramapo Road Garnerville, New York 10923

Project No: TRFD 2302

BOARD OF FIRE COMMISSIONERS

Robert Masiello, Commissioner Larry Berkowitz, Commissioner Amanda Fulgencio, District Secretary Anthony Rocci, Purchasing Agent Daniel Coughlin, Chief of Department Kenneth Connolly, Fire Assistant Chief

FINANCIAL ADVISOR:

Capital Markets Advisors, Inc. Richard Tortora, President Anthony Nash, Senior Vice President

BOND COUNSEL:

Hawkins Delafield & Wood LLP William Jackson, Esq. Partner Zachary Polo, Esq., Associate

DISTRICT COUNSEL:

Hood, Hood & Hood Jay Hood, Jr. Esq.

CONSTRUCTION MANAGER:

The Palombo Group Luis Rodriguez

FEBRUARY 2025

Prepared by: H2M architects + engineers 538 Broad Hollow Road, 4th Floor East Melville, NY 11747 tel 631.756.8000 fax 631.694.4122



PROJECT MANUAL PREFACE

| OWNER: | Thiells-Roseville Fire District Rockland County, New York 99 West Ramapo Road Garnerville, New York 10923 |
|------------|--|
| PROJECT: | New 26-100 Fire Headquarters 65 W Ramapo Road Garnerville, New York 10923 |
| INTENT: | This is a Multi-prime Contract, NYS Prevailing Wage Project. |
| ARCHITECT: | H2M Architects + Engineers 538 Broad Hollow Road Melville, NY 11747 P: (516) 756-8000 x 1318 www.h2m.com |

NOTES TO BIDDERS:

- 1. There are no "Supplementary Conditions" to the AIA documents as all modifications to AIA documents are within the documents themselves.
- 2. The Owner is a tax-exempt entity.
- 3. This is a publicly bid project and is subject to NYS Prevailing Wages and Wicks Law.
- 4. Every worker employed on the project must carry on them a copy of a bona fide OSHA 10hour safety training course completion card. All OSHA information must be delivered to the Owner prior to any worker being allowed to start any work.
- 5. The Owner will pay for the Building Permit. The GC will coordinate with the Owner and Architect to obtain the permit.
- 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. (Sewer -Contract 'C') (Water – Contract 'P') (Gas – Contract 'P') (Electric – Contract 'E'), (DOT – Contract 'C')
- 7. Local, State and County fees and/or permits are in force for this project and will be obtained and paid for by the responsible Contractor.
- 8. 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.
- 9. The Contractors and all sub-contractors shall have a valid New York license applicable to their trade of work, if so required.
- 10. It is the responsibility of the Contractor to forward addenda and other pertinent information to subcontractors, suppliers and vendors.
- 11. All questions during the bidding phase are to be posed by email to the following email address only: <u>dsherland@h2m.com</u>. The subject line should be **Thiells Roseville Fire District New 26-100 Fire Headquarters**. 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.
- 12. Any reference to Prime Contractor indicates The General Construction Contractor.
- 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. Use Charges: Costs and use charges for all temporary water and electric or any other utility or temporary service are <u>by the Owner</u>.



- 16. 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.
- 17. All costs, requirements, permits, inspections (other than Special Inspections by the Owner) shall be borne by the General Contractor.
- 18. 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 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.
- 19. A final survey by the Site / Civil Contractor is required upon substantial completion.
- 20. 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.
- 21. Contractor shall obtain and maintain insurance in accordance with the requirements set forth in the **Contractors Insurance and Bond Requirements**.

END OF SECTION



THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD, GARNERVILLE, New York 10923 H2M project No.: TRFD 2302

Contract G – General Construction Work Contract P – Plumbing Construction Work Contract M – Mechanical Construction Work Contract E – Electrical Construction Work Contract C – Civil/Site Work

Front End Documents

Division 00 – Procurement and Contract Requirements

Preface Table of Contents List of Drawings Notice to Bidders Instructions for Bidders **Contractors Insurance and Bond Requirements** Bid Bond Qualifications of Bidders – NYS document CCA – 1 (10/2005) Certification of Compliance Iran Divestment Act Sexual Harassment Certification Bidder's Proposal (PA, PB-G, PB-P, PB-M, PB-E, PB-C, PC, PD, PE) List of Subcontractors Prevailing Hourly Wage and Supplements Weekly Payroll Form – PW12 Sample Contract – AIA A32 – 2009, Standard Form of Agreement between Owner and Contractor, Construction Manager as Adviser Edition Sample GC – AIA A232 - 2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition Sample Documents AIA G732, AIA G702, AIA G703, AIA G706, AIA G706A, AIA G707, AIA 312 – Performance / Payment Bond

Division 01 – General Requirements

| 01 12 00 | Summary of Multi Prime Contracts |
|-------------|--|
| 01 14 00 | Work Restrictions |
| 01 21 00 | Allowances |
| 01 23 00 | Alternates |
| 01 25 00 | Product Substitution Procedures |
| 01 26 00 | Contract Modification Procedures |
| 01 29 00 | Payment Procedures |
| 01 31 15 | Coordination Between Multi-Primes |
| 01 31 19 | Progress Meetings |
| 01 32 16 | Construction Schedule |
| 01 32 23 | Surveying |
| 01 33 00 | Submittals |
| 01 41 00 | Regulatory Requirements |
| 01 42 23 | Specification Format |
| 01 43 20 | Pre–Installation Meetings |
| 01 45 00.11 | Statement of Special Inspections and Tests |
| 01 45 36 | Environmental Quality Controls |
| 01 50 00 | Temporary Facilities and Controls |
| 01 57 19 | Temporary Environment Controls |

- 01 58 13 Project Sign
- 01 61 00 Basic Product Requirements
- 01 61 16 VOC Content Restrictions
- 01 65 00 Product Delivery, Storage and Handling
- 01 74 23 Cleaning
- 01 75 00 Starting and Adjusting
- 01 78 00 Closeout Submittals
- 01 78 23 Operating and Maintenance Data
- 01 78 39 Project Record Documents
- 01 78 43 Spare Parts
- 01 79 00 Demonstration and Training
- 01 91 13 General Commissioning Requirements

Technical Specifications

Division 02 – Existing Conditions

02 41 16 Structure Demolition

Division 03 – Concrete

| 03 30 00 | Cast-In Place Concrete |
|----------|------------------------|
| 03 35 01 | Concrete Finishing |
| 03 36 00 | Grouting |

Division 04 – Masonry

| 04 21 13 | Brick Masonry |
|----------|-------------------------------|
| 04 22 00 | Concrete Unit Masonry |
| 04 70 00 | Adhered Concrete Stone Veneer |

Division 05

- 05 12 00 Structural Steel Framing
- 05 31 00 Steel Decking
- 05 40 00 Cold-Formed Metal Framing
- 05 50 00 Metal Fabrications
- 05 51 00 Metal Stairs and Railings
- 05 51 33 Metal Ladders
- 05 52 13 Pipe and Tube Railings

Division 06 – Wood, Plastics and Composites

- 06 10 00 Rough Carpentry
- 06 16 43 Gypsum Sheathing
- 06 20 00 Finish Carpentry
- 06 41 13 Wood Veneer Faced Casework
- 06 41 16 Plastic Laminate Faced Casework

Division 07 – Thermal and Moisture Protection

- 07 05 43 Cladding Support System
- 07 11 13 Bituminous Damp proofing
- 07 21 00 Thermal Insulation
- 07 21 13 Mineral Fiber Board Insulation
- 07 27 26 Air and Weather Barriers
- 07 46 16 Metal Cladding



- 07 46 46.11 Cementitious Wall Panels
- 07 53 23 Ethylene Propylene Diene Monomer Roofing
- 07 62 00 Sheet Metal Flashing and Trim
- 07 72 00 Roof Accessories
- 07 92 00 Joint Sealants

Division 08 – Openings

- 08 11 13 Hollow Metal Doors and Frames
- 08 14 16 Flush Wood Doors
- 08 31 13 Access Doors and Frames
- 08 35 13 Four-Fold Doors
- 08 36 13 Sectional Overhead Doors
- 08 41 13 Aluminum Framed Entrances and Storefronts
- 08 44 13 Glazed Aluminum Curtain Walls
- 08 51 13 Aluminum Windows
- 08 71 00 Door Hardware
- 08 80 00 Glazing
- 08 83 00 Mirrors
- 08 87 33 Architectural Window Film
- 08 91 19 Fixed Louvers

Division 09 – Finishes

- 09 21 16 Gypsum Board Assemblies
- 09 22 16 Non-structural Metal Framing
- 09 26 00 Gypsum Board Suspension System
- 09 29 00 Gypsum Board
- 09 30 13 Ceramic Tiling
- 09 30 16 Quarry Tiling
- 09 51 13 Acoustical Panel Ceilings
- 09 54 23 Linear Metal Ceilings
- 09 65 13 Resilient Base and Accessories
- 09 65 13.23 Resilient Stair Treads
- 09 65 19.23 Luxury Vinyl Tile
- 09 65 66 Resilient Athletic Flooring
- 09 67 16 Fluid-Applied Flooring
- 09 68 13 Carpet Tile
- 09 72 00 Wall Coverings
- 09 77 16 Framed Decorative Panel System
- 09 77 20 Fiber Reinforced Plastic Panels
- 09 91 00 Painting
- 09 93 00 Staining and Transparent Finishing

Division 10 – Specialties

- 10 11 00 Visual Display Surfaces
- 10 14 00 Signage
- 10 14 53 Traffic Signs
- 10 21 13.17 Phenolic Toilet Compartments
- 10 22 26.11 Operable Partitions
- 10 28 13 Toilet and Miscellaneous Accessories
- 10 28 26 Hygiene Accessories
- 10 43 10 Safety Equipment AED
- 10 43 13 Defibrillator Cabinets
- 10 43 19 Emergency Eyewash Station
- 10 44 00 Fire Protection Specialties

- 10 44 13.13 Fire Protection Cabinets Fire Rated
- 10 51 29 Phenolic Lockers and Benches
- 10 75 00 Flagpoles

Divisions 11 - Equipment

- 11 11 36 Vehicle Charging Equipment
- 11 52 13 Projection Screens
- 11 96 00 Firematic Equipment

Division 12 – Furnishings

| 12 24 00 | Window Shades |
|-------------|------------------------------|
| 12 31 00 | Manufactured Metal Casework |
| 12 35 59 | Display Casework |
| 12 36 40.13 | Synthetic Quartz Countertops |
| 12 36 31.16 | Solid Surfacing Countertops |
| 12 43 13 | Floor Grates and Frames |
| | |

Division 13 – Special Construction

13 34 00 Pre-Engineered Wood Framed Buildings

Division 14 – Conveying Equipment

14 24 00 Machine Room-Less Traction Passenger Elevator

Divisions 15 – 20

Not Used

Divisions 21 – Fire Suppression

- 21 05 29 Pipe Hangers and Support
- 21 13 00 Sprinkler and Standpipe Piping
- 21 13 13 Sprinkler Systems
- 21 24 00 Dry Chemical Extinguishing System

Divisions 22 – Plumbing

- 22 05 23 Valves for Plumbing Systems
- 22 05 29 Pipe Hangers and Supports for Plumbing Piping
- 22 05 49 Concrete Pads for Plumbing Equipment
- 22 05 53 Identification for Plumbing Piping and Valves
- 22 05 76 Drainage Accessories
- 22 05 77 Floor and Area Drains
- 22 07 00 Plumbing Piping Insulation
- 22 08 00 Cleaning and Testing for Plumbing Piping
- 22 11 00 Plumbing Piping
- 22 11 16 Vacuum Breakers
- 22 11 18 Backflow Preventors
- 22 11 19 Water Supply Accessories
- 22 11 20 Mixing Valves
- 22 11 22 Thermometers and Gauges
- 22 11 23 Pumps for Plumbing Systems
- 22 11 26 Strainers

- 22 14 26 Roof Drains
- 22 14 29 Submersible Sump Pump
- 22 33 01 Domestic Water Heaters
- 22 33 02 Gas Booster Pump
- 22 42 00 Plumbing Fixtures
- 22 42 23 Showers
- 22 47 13 Drinking Fountains

Division 23 – Heating, Ventilation and Air Conditioning

- 23 00 10 General Mechanical Requirements
- 23 05 29 Pipe Hangers and Supports
- 23 05 55 Mechanical System Identification
- 23 05 94.12 Balancing of Air Systems
- 23 07 00 Pipe Insulation
- 23 07 19 Ductwork Insulation
- 23 08 00 Commissioning of Mechanical Systems
- 23 09 91 Instrumentation and Control Integration
- 23 09 93 Sequence of Operations
- 23 20 01 Condensate Drain Piping
- 23 23 00 Refrigerant Piping
- 23 31 13 Sheet Metal Work
- 23 34 16 Exhaust Fans
- 23 34 18 Vehicle Exhaust Systems
- 23 37 01 Louvered Air Inlets and Outlets
- 23 37 13 Diffuser Registers and Grilles
- 23 38 13 Kitchen Hood Systems
- 23 60 02.22 Vehicle Exhaust Gas Detection System
- 23 81 26 Ductless Split System Air Conditioner
- 23 82 26.12 Multiple Evaporator, Direct Expansion, Air-Cooled, Variable Capacity, Split Systems
- 23 82 39 Electric Heaters

Divisions 24 - 25

Not Used

Division 26 – Electrical

- 26 00 00 Electrical
- 26 05 19 Low-Voltage Electrical Power Conductors and Cables
- 26 05 26 Grounding and Bonding for Electrical Systems
- 26 05 29 Hangers and Supports for Electrical Systems
- 26 05 33 Raceways and Boxes for Electrical Systems
- 26 05 53 Identification for Electrical Systems
- 26 18 23 Surge Protection
- 26 24 00 Panelboards
- 26 27 26 Wiring Devices
- 26 28 16 Enclosed Switches and Circuit Breakers
- 26 29 14 Combination Motor Controllers
- 26 29 17 Transfer Switch (Wall Mount)
- 26 32 14 Natural Gas Engine Generator Systems
- 26 32 15.13 Load Bank and Controller Pad Mounted
- 26 50 00 Lighting
- 26 71 73 Electrical Utility Services
- 26 71 74 Temporary Electrical Utility Services and Controls

Division 27

Not Used

Division 28 - Electronic Safety and Security

28 31 00.01 Fire Detection and Alarm

Division 29 – 30 – Not Used

Division 31 – Earthwork

| 31 11 00 | Site Clearing |
|----------|---------------|
|----------|---------------|

- 31 22 13 Rough Grading
- 31 23 16 Excavation
- 31 23 19 Dewatering 31 23 23.13 Backfill
- 31 23 23.13 Dackill
- 31 23 33 Trenching

Division 32 – Exterior Improvements

- 32 11 23.13 Crushed Stone Aggregate Base Course
- 32 12 16 Asphaltic Concrete Paving
- 32 13 13.26 Portland Cement Concrete Paving
- 32 13 13.33 Portland Cement Concrete Sidewalk
- 32 16 13 Portland Cement Concrete Curb
- 32 17 13 Parking Bumpers
- 32 17 26 Tactile Warning Surfacing
- 32 17 28 Pavement Markings Traffic Paint
- 32 30 00 Site Bollards
- 32 32 15 Precast Modular Block Gravity Retaining Wall
- 32 91 19.13 Topsoil Placement and Grading
- 32 92 19.16 Hydroseeding
- 32 29 30 Plants

Division 33 – Utilities

- 33 05 61 Concrete Manholes
- 33 36 13 Grease Trap
- 33 41 16 Corrugated Polyethylene Piping
- 33 41 19 Rip Rap
- 33 41 23 PVC Pipe
- 33 44 13.13 Precast Concrete Catch Basins and Field Inlets
- 33 44 16.13 Cast In Place Formed Trench Drain Units
- 33 44 19.13 Stormwater Treatment Units
- 33 49 13.13 Storm Drainage Manholes
- 34 71 13.27 Timber Guide Rail

Divisions 34 - 49

Not Used



Informational Appendices

| Appendix A: | 2023 Geotechnical Report |
|-------------|--------------------------|
| | Einiala Oalaaduda |

- Appendix B:Finish ScheduleAppendix C:NYS DOT Standard Details

END OF TABLE OF CONTENTS



THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD, GARNERVILLE, New York 10923 H2M project No.: TRFD 2302

Contract G – General Construction Work Contract P – Plumbing Construction Work Contract M – Mechanical Construction Work Contract E – Electrical Construction Work Contract C – Civil Construction Work

Informational Drawings – All Contracts

G 000: Tile, Drawing List, General Notes & Alternates G 001: General Notes & Abbreviations G 101: Code Analysis & Egress Plan

Soil Boring Drawings – All Contracts

B 111: Soil Boring Information

Civil Drawings - Contract G

- V 100: Existing Conditions Plot Plan
- CD 101 Demolition Site Plan
- CS 100 Dimensional Site Plan
- C 100: Grading and Drainage Plan
- C 110: Soil Erosion and Sediment Control Plan
- C 500: Site Details
- C 501: Site Details

Structural Drawings – Contract G

- S 100: Foundation Plan and Design Loads
- S 111: Slab Plan
- S 500: Foundation Details

Architectural Drawings – Contract G

- A 110: Partition Types, First Floor Construction Plan, Notes & Legend
- A 120: First Floor Reflected Ceiling Plan & Notes
- A 130: Roof Construction Plan, Notes & Legend
- A 201: Building Elevations
- A 201A: Alternate G-01 Partition Type, Building Elevations and Wall Section
- A 202: Building Elevations
- A 202A: Alternate G-01 Building Elevations
- A 301: Building Sections
- A 302: Wall Sections
- A 401: Enlarged Toilet Plan, Interior Elevations, Accessory Schedule, Finish Schedule and Signage Detail
- A 601: Door Schedule & Door Details

HVAC Drawings – Contract M

- M 001: HVAC Legends, Symbols Abbreviations and General Notes
- M 101: HVAC Construction Plan
- M 500: HVAC Details
- M 600: HVAC Schedules



THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD, GARNERVILLE, New York 10923 H2M project No.: TRFD 2302

Plumbing Drawings – Contract P

- P 001: Plumbing Notes, Legend, Abbreviations and Schedules
- PS 100: Plumbing Site Plan
- P 121: Domestic Water and Gas First Floor Plan
- P 130: Sanitary & Vent Underslab Plan
- P 131: Sanitary & Vent First Floor Plan
- P 500: Plumbing Schedules & Details
- P 600: Plumbing Riser Diagrams

Electrical Drawings – Contract E

- E 001: Electrical General Notes and Legends ES 100: Electrical Site Plan ES 100A: Alternate E-01 Electrical Site Plan E 101: First Floor Power and Low Voltage Plan E 111: First Floor HVAC Power Plan E 121: First Floor Lighting Plan E 140: Generator Plan E 500: Electrical Details
- E 501: Electrical Details
- E 540: Generator Details
- E 600: Electrical Schedules
- Fire Alarm Drawings Contract E

FA 001: Fire Alarm Legends and Riser Diagrams FA 100: First Floor Fire Alarm Plan FA 101: Fire Alarm Attic Plan

END OF SECTION



Notice is hereby given that SEALED PROPOSALS for:

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD, GARNERVILLE, New York 10923 H2M project No.: TRFD 2302

Contract G – General Construction Work Contract M – HVAC Work Contract C – Civil / Site Work

Contract P – Plumbing Construction Work Contract E – Electrical Construction Work

Will be received and until **12:00PM prevailing time on Tuesday, April 1st, 2025,** at the **District Building**, located at **99 West Ramapo Road, Garnerville, NY 10923** at which time and place where all bids received will be publicly opened and read and where the identity of all offers will be publicly disclosed.

Hard copies and electronic bid documents will be available beginning at **4:00PM** prevailing time on **Tuesday, February 25th, 2025.**

Complete Digital Sets of bidding documents, plans and specifications, may be obtained online as a download at the following website: <u>melville.h2mplanroom.com</u> for a nonrefundable fee of **One Hundred Dollars (\$100.00)** for each combined set of documents. Plans and Specifications may be obtained from **Revplans, 28 Church Street, Unit 7, Warwick, New York 10990**, upon deposit of **One Hundred Dollars (\$100.00)** for each combined set of documents, Checks or money orders shall be made payable to **THIELLS-ROSEVILLE FIRE DISTRICT**, checks should be sent directly to REVplans. Bidder's deposit will be refunded if the set is returned to **REV** in good condition within thirty (30) days following the award of the contract or the rejection of the bids covered by such plans and specifications. **Non-bidders** shall receive partial reimbursement, in an amount equal to the amount of the deposit, less the actual cost of reproduction of the bids covered by such plans and specifications to the rejection of the bids covered by such plans to the award of the contract or the rejection of the bids covered by such plans and specifications. **Non-bidders** shall receive partial reimbursement, in an amount equal to the amount of the deposit, less the actual cost of reproduction of the documents if the set is returned in good condition within thirty (30) days following the award of the covered by such plans and specifications. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

Please note REVplans (melville.h2mplanroom.com) is the designated location and means for distributing and obtaining all bid package information. Only those Contract Documents obtained in this manner will enable a prospective bidder to be identified as an official plan holder of record. The Provider takes no responsibility for the completeness of Contract Documents obtained from other sources. Contract Documents obtained from other sources may not be accurate or may not contain addenda that may have been issued.

All bid addenda will be transmitted to registered plan holders via email and will be available <u>at **melville.h2mplanroom.com**</u>. 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: THIELLS-ROSEVILLE FIRE DISTRICT, clearly marked on the outside: Bid For: New 26-100 Fire Headquarters.

Each proposal submitted must be accompanied by a certified check or bid bond, made payable to the THIELLS-ROSEVILLE FIRE DISTRICT 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. <u>Certification of bonding company is required for this bid,</u> 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 **12:00PM on Tuesday**, **March 11th**, **2025**. Potential bidders are asked to gather at the site located at 65 W Ramapo Road, Garnerville, New York 10923 at which time they will be escorted to the areas of work.

It is the Board of Fire Commissioner's 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.

Thiells Roseville Fire District Rockland County, New York Board of Fire Commissioners



BIDS FOR PROJECT

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

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD, GARNERVILLE, New York 10923 H2M project No.: TRFD 2302

Contract G – General Construction Work Contract P – Plumbing Construction Work Contract M – Mechanical Construction Work Contract E – Electrical Construction Work Contract C – Civil / Site Work

TIME AND PLACE

The sealed proposals are to be submitted at the:

Thiells Roseville Fire District New 26-100 Fire Headquarters 99 W Ramapo Road Thiells, New York 10923

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 of 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.

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 and comparable scope on Long Island, 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 David Sherland, AIA 538 Broad Hollow Road, 4th Floor East Melville, New York 11747

 Phone:
 (631) 756-8000 Ext. 1318

 Fax:
 (631) 694-4122

 e-mail:
 <u>dsherland@h2m.com</u>

To be given consideration, questions must be received by Day, Month XX, 2025 at 5PM.

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 David Sherland, AIA 538 Broad Hollow Road, 4th Floor East Melville, New York 11747

 Phone:
 (631) 756-8000 Ext. 1318

 Fax:
 (631) 694-4122

 e-mail:
 <u>dsherland@h2m.com</u>

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 for 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.

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 THIELLS ROSEVILLE 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 THIELLS ROSEVILLE 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 <u>required</u> information. Bidders failing to provide this information <u>will not</u> be considered. Provide a <u>certified statement</u> 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/her, his/her employees, or his/her work hereunder in his/her 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/herself 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/her 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/her, 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/her designee, determines that such disclosure was not made for the purpose of restricting competition.

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

Each Contractor shall pay not less than the minimum hourly wage rates on those contracts as established in accordance with Section 220 of the Labor Law as shown in the schedule.

Article 8, Section 220 of the Labor Law, as amended by Chapter 750 of the Laws of 1956, provides (among other things) that it shall be the duty of the fiscal officer to make a determination of the schedule of wages to be paid to all laborers, workers and mechanics employed on public work projects, including supplements for welfare, pension, vacation and other benefits. These supplements include hospital, surgical or medical insurance, or benefits; life insurance or death benefits; accidental death or dismemberment insurance; and pension or retirement benefits. If the amount of supplements provided by the employer is less than the total supplements shown on the wage schedule, the difference shall be paid in cash to the employee.



Article 8, Section 220 of the Labor Law, as amended by Chapter 750 of the Laws of 1956, also provides that the supplements to be provided to laborers, workers and mechanics upon public work, "...shall be in accordance with the prevailing practices in the locality..." The amount for supplements listed on the enclosed schedule does not necessarily include all types of prevailing supplements in the locality, and a future determination of the Industrial Commissioner may require the Contractor to provide additional supplements. The original payrolls or transcripts shall be preserved for three (3) years from the completion of the work on the awarded project by the Contracts. The Owner shall receive such payroll record upon completion of project.

THIELLS ROSEVILLE 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 Thiells Roseville 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

Waiver of subrogation required in favor of the indemnified parties.

- 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.

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.

3) Owner's protective liability insurance.

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

4) 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
 - (b) Applicable Federal
 - (c) Employer Liability
- Statutory

Statutory

- (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.

- 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 Combi

| \$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
- 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 & | |
| | Labor and material | |
| | Payment Bonds - | 125% of contract bid for period of construction. |
| 3) | Maintenance Bond- | 100% of contract price for two years after final completion. |



<u>ADDITIONAL INSUREDS</u>: The following shall be named as additional insureds on all policies, naming same as a "Certificate Holder" will not satisfy this requirement.

1) The Thiells Roseville Fire District, The Board of Fire Commissioners of the Thiells Fire District, its agents, assigns and employees.

Mailing address: Board of Fire Commissioners PO BOX 186 Garnerville, New York 10923

- H2M architects + engineers
 538 Broad Hollow Road, 4th Floor East Melville, New York 11747
- The Palumbo Group
 22 Noxon Street
 Poughkeepsie, New York 12601



AFT AIA Document A310 - 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

«<u>To Be Determined</u>-»«-» « »

OWNER:

(Name, legal status and address) «Thiells Roseville Fire District -»«-» «99 West Ramapo Road-» «Garnerville, New York 10923»

BOND AMOUNT: \$ « TBD - 5% of Bid »

PROJECT:

(Name, location or address, and Project number, if any) «Miscellaneous Forms» Thiells Roseville Fire District New 26-100 Fire Headquarters 65W Ramapo Road Garnerville, New York 10923

« »

« »

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.

SURETY:

(Name, legal status and principal place of business) « To Be -->Determined >>«->> « »

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.





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.

AIA Document A310 - 2010. Copyright © 1963, 1970 and 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 14:26:38 ET on 12/31/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for 1 one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, email docinfo@aiacontracts.com. User Notes:

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.

| | « » | |
|-----------|---------------------------|-----------------|
| | (Contractor as Principal) | (Seal) |
| | « » | |
| (Witness) | (Title) | |
| | « » | |
| | (Surety) | (Seal) |
| | « » | |
| (Witness) | (Title) | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | $ \land \land$ |
| | | $\int \nabla V$ |
| | | |
| | | |
| | | |
| | | |
| | | \frown |
| | | |
| | | |
| | | |
| | | |

AIA Document A310 - 2010. Copyright © 1963, 1970 and 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "American Institute of Architects," "American Institute of Architects," "AlA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 14:26:38 ET on 12/31/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com. User Notes:

2

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 <u>MAY</u> BE REQUIRED TO COMPLETE AND SUBMIT THE NEW YORK STATE UNIFORM CONTRACTING QUESTIONNAIRE <u>AFTER RECEIPT OF</u> <u>BIDS</u>, TO ASSIST IN DETERMINING THE BIDDER'S QUALIFICATIONS.

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: _____

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:

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

Contract G – General Construction Work Contract P – Plumbing Construction Work Contract M – Heating Ventilation and Air Conditioning Work Contract E – Electrical Construction Work Contract C – Civil /Site Work

To: Thiells Roseville Fire District 99 West Ramapo Road Garnerville, New York 10923

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

| Made this | _ day of | , 20, by |
|-----------|----------|----------|
| | | |
| | | |

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:

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

BID DATE: _____

BASE BID

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 | (| ` |
|--|-----------------------|-------------|
| (Written in Words): ITEM 2 – DIVISION 1 – BONDS AND INSURANCE | (\$ |) |
| (Written in Words): | (\$ |) |
| ITEM 3 - DIVISION 1 – GENERAL ALLOWANCE | (Ψ | |
| (Allowance): One Hundred and Fifty Thousand Dollars and Zero Cents | (\$ | 150,000.00) |
| ITEM 4 – DIVISION 3 – CONCRETE | <u> </u> | , , |
| (Written in Words): | (\$ |) |
| ITEM 5 – DIVISION 4 – MASONRY | · | • |
| (Written in Words): | (\$ |) |
| ITEM 6 – DIVISION 5 – STRUCTURAL AND MISC STEEL | | |
| (Written in Words): | (\$ |) |
| ITEM 7 – DIVISION 5 – METAL DECKING | | |
| (Written in Words): | (\$ |) |
| ITEM 8 – DIVISION 5 – STAIRS, RAILINGS AND LADDERS | (* | , |
| (Written in Words): | (\$ |) |
| ITEM 9 – DIVISION 6 – ROUGH AND FINISHED CARPENTRY | (ተ | ` |
| (Written in Words): ITEM 10 – DIVISION 6 – CASEWORK | (\$ |) |
| (Written in Words): | (\$ |) |
| ITEM 11 – DIVISION 7 – THERMAL AND MOISTURE PROTECTION | (φ |) |
| (Written in Words): | (\$ |) |
| ITEM 12 – DIVISION 7 – ROOFING | (Ψ | / |
| (Written in Words): | (\$ |) |
| ITEM 13 – DIVISION 8 – OPENINGS | (+ | / |
| (Written in Words): | (\$ |) |
| ITEM 14 – DIVISION 8 – APPARATUS BAY DOORS | X ¹ | , |
| (Written in Words): | (\$ |) |
| ITEM 15 – DIVISION 8 – ALUMINUM WINDOWS | | · |
| (Written in Words): | (\$ |) |
| ITEM 16 – DIVISION 8 – CURTAIN WALLS | | |
| (Written in Words): | (\$ |) |
| ITEM 17 – DIVISION 9 – FINISHES | | |
| (Written in Words): | (\$ |) |
| ITEM 18 – DIVISION 10 – SPECIALTIES | (* | , |
| (Written in Words): | (\$ |) |
| ITEM 19 – DIVISION 11 – EQUIPMENT | (\$ | , |
| (Written in Words): ITEM 20 – DIVISION 12 – FURNISHINGS | (\$ |) |
| | (\$ |) |
| (Written in Words): ITEM 21 – DIVISION 12 – WINDOW TREATMENTS | (Þ |) |
| (Written in Words): | (\$ | ١ |
| ITEM 22 – DIVISION 13 – SPECIAL CONSTRUCTION | (Ψ |) |
| (Written in Words): | (\$ | ١ |
| ITEM 23 – DIVISION 14 – CONVEYING EQUIPMENT | (Ψ |) |
| (Written in Words): | (\$ |) |
| | (+ | / |



THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

BID DATE: _____

| TOTAL BASE BID (INCLUDING ITEMS 1 THRU 25) (Written in Words): | (\$ |) |
|---|-----|---|
| ITEM 25 - DIVISION 1 – PROJECT RECORD DOCUMENTS (Written in Words): | (\$ |) |
| ITEM 24 – DIVISION 1 – PROJECT CLOSEOUT (Written in Words): | (\$ |) |

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

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

BID DATE: _____

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 for the respective contract being bid on must be completed. Failure to do so can be grounds for disqualification of the bidder.

| ALTERNATES | | |
|---|---|------|
| Contract-Number | Description of Alternate | Cost |
| Alternate #G-01 Four-Fold Doors (Contract 'G') | Contract 'G' to provide four-fold style door in lieu of fully glazed sectional overhead doors at OH-1, OH-2, OH-3, OH-4 & OH-5 (typical of 5 locations). Refer to four-fold specification for additional information. <u>Note:</u> This alternate is associated with and will be awarded with Alternate P-03. Base Bid: Provide fully glazed sectional overhead doors at overhead doors OH-1, OH-2, OH-3, OH-4 & OH-5 (typical of 5 locations). | \$ |
| Alternate #G-02 Multi-Purpose Room Ceiling (Contract 'G') | Contract 'G' to provide ACP-2 in lieu of base bid linear metal ceilings in Multi-Purpose Room 203A and 203B. | \$ |
| Alternate #G-03 Service Area Equipment (Multi- Purpose Room) (Contract 'G') | Contract 'G' to provide all equipment listed for Multi- Purpose Room 203 listed as 'N.I.C'. Equipment labeled as 'existing' shall not be included in price to furnish equipment. Base bid price shall include installation of all equipment furnished by owner. | \$ |
| | PB-G - 3 | |

PROPOSAL: CONTRACT G - GENERAL CONSTRUCTION WORK

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

H 2 M

BID DATE: _____

| Alternate #G-04 Kitchen Equipment (Contract 'G') | Contract 'G' to provide all equipment listed for Kitchen 201 listed as 'N.I.C'. Equipment labeled as 'existing' shall not be included in price to furnish equipment. Base bid price shall include installation of all equipment furnished by owner. | \$ |
|--|---|----|
| Alternate #G-05 | Contract 'G' to provide halo lit lettering signage in lieu of non-illuminated building mounted signage. Refer to Contract Drawings and Specification 101400 for additional information. | \$ |
| Signage (Contract 'G') | Base bid: provide 18" high non-illuminated cast aluminum lettering signage. Note: this alternate is associated with, and will be awarded with Alternate E-04. | |
| Alternate #G-06 Firematic Equipment (Contract 'G') | Contract 'G' to provide all equipment listed for rooms: Laundry 115, SCBA 121, Work Room 117, and Outdoor Storage 114 listed as 'N.I.C.'. Equipment labeled as 'existing' shall not be included in price to furnish equipment. | \$ |
| | Base bid price shall include installation of all equipment furnished by owner. | |
| Alternate #G-07 Exterior Pavillion (Contract 'G') | Contract 'G' to provide and install exterior pavilion in outdoor wellness area, including poured concrete foundations, and pre-engineered wood structure (see Specification 133400). Refer to Drawing A 428 for general layout. | \$ |
| | All concrete flatwork, including sidewalks and pad, as shown on the dimensional site plan shall be provided by Contract 'C' as base bid scope. | |

BID DATE: _____

ADDENDUM

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

| Addendum # | Date | Received by: | Reviewed & Incorporated into Bid by: |
|------------|------|--------------|--------------------------------------|
| | | | |
| | | | |
| | | | |
| | | | |

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 Thiells Roseville Fire District reserves the right to award this contract to other than the low bidder.

The Prime 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 Prime 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 the manner and within three hundred & sixty five (365) calendar days 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 <u>and</u> 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.

BID DATE: _____

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 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: _____

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: (____)

Date:

Federal I.D. No. or Social Security No. :_____

BID DATE:

BASE BID

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 | | |
|---|-----|--------------------|
| (Written in Words): | (\$ |) |
| ITEM 2 – DIVISION 1 – BONDS AND INSURANCE | | |
| (Written in Words): | (\$ |) |
| ITEM 3 - DIVISION 1 – GENERAL ALLOWANCE | | |
| (Allowance): Seventy Five Thousand Dollars and Zero Cents | (\$ | 75,000.00) |
| ITEM 4 – DIVISION 1 – UTILITY ALLOWANCE | | |
| (Allowance): Seventy Five Thousand Dollars and Zero Cents | (\$ | 75,000.00) |
| ITEM 5 – DIVISION 21 – FIRE SUPPRESSION | | |
| (Written in Words): | (\$ |) |
| ITEM 6 – DIVISION 22 – PLUMBING | | |
| (Written in Words): | (\$ |) |
| ITEM 7 – DIVISION 1 – PROJECT CLOSEOUT | | |
| (Written in Words): | (\$ |) |
| ITEM 8 - DIVISION 1 – PROJECT RECORD DOCUMENTS | | |
| (Written in Words): | (\$ |) |
| TOTAL BASE BID (INCLUDING ITEMS 1 THRU 8) | | |
| (Written in Words): | (\$ |) |

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

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 for the respective contract being bid on must be completed. Failure to do so can be grounds for disqualification of the bidder.

| ALTERNATES | | | | |
|--|--|------|--|--|
| Contract-Number | Description of Alternate | Cost | | |
| Alternate #P-01 Under Carriage Wash System (Contract 'P') | Contract 'P' to provide under carriage wash system as indicated in the contract drawings. Alternate pricing shall include all material and labor for a complete installation. | \$ | | |
| Alternate #P-02 Fueling Island (Contract 'P') | Contract 'P' to provide fueling island as shown on PS 101 and PS 102. <u>Note:</u> this alternate is associated with, and will be awarded with Alternate E-03. | \$ | | |
| Alternate #P-03 Four-Fold Door Sprinklers (Contract 'P') | Contract 'P' to provide deduct pricing to remove sidewall sprinkler heads shown on FP 100 and associated branch piping. <u>Note:</u> this alternate is associated with, and will be awarded with Alternate G-01. | \$ | | |
| Alternate #P-04 Gas Booster Pump (Contract 'P') | Contract 'P' to provide gas booster pump and associated enclosure, piping, valves, and materials as indicated on contract documents. <u>Note:</u> this alternate is associated with, and will be awarded with Alternate E-06. | \$ | | |

BID DATE: _____

ADDENDUM

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

| Addendum # | Date | Received by: | Reviewed & Incorporated into Bid by: |
|------------|------|--------------|--------------------------------------|
| | | | |
| | | | |
| | | | |
| | | | |

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 Thiells Roseville Fire District reserves the right to award this contract to other than the low bidder.

The Prime 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 Prime 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 the manner and within three hundred & sixty five (365) calendar days 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 <u>and</u> 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.

| PROPOSAL: CONTRACT P | - PLUMBING CONSTRUCTION WORK |
|----------------------|------------------------------|
|----------------------|------------------------------|

BID DATE: _____

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 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: |) NIC | GHT: (|) | |
|------|-------|--------|---|--|
| | | - | | |

| FAX: | (| |
|------|---|--|
| | | |

Federal I.D. No. or Social Security No. :_____

BID DATE: _____

BASE BID

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 | | |
|--|-----|------------|
| (Written in Words): | (\$ |) |
| ITEM 2 – DIVISION 1 – BONDS AND INSURANCE | | |
| (Written in Words): | (\$ |) |
| ITEM 3 - DIVISION 1 – GENERAL ALLOWANCE | | |
| (Allowance): | (\$ | 75,000.00) |
| ITEM 4 – DIVISION 23 – GENERAL MECHANICAL REQUIREMENTS | | |
| (Written in Words): | (\$ |) |
| ITEM 5 – DIVISION 23 – COMMISSIONING OF MECHANICAL SYSTEMS | | |
| (Written in Words): | (\$ |) |
| ITEM 6 – DIVISION 23 – VRF SYSTEMS | | |
| (Written in Words): | (\$ |) |
| ITEM 7 – DIVISION 23 – DEDICATED OUTSIDE AIR SYSTEM | | |
| (Written in Words): | (\$ |) |
| ITEM 8 – DIVISION 23 – DUCTWORK | | |
| (Written in Words): | (\$ |) |
| ITEM 9 – DIVISION 23 – GAS AND ELECTRIC HEATERS | | |
| (Written in Words): | (\$ |) |
| ITEM 10 – DIVISION 23 – MISCELLANEOUS MECHANICAL WORK | | |
| (Written in Words): | (\$ |) |
| ITEM 11 – DIVISION 1 – PROJECT CLOSEOUT | | |
| (Written in Words): | (\$ |) |
| ITEM 12 - DIVISION 1 – PROJECT RECORD DOCUMENTS | | |
| (Written in Words): | (\$ |) |
| TOTAL BASE BID (INCLUDING ITEMS 1 THRU 6) | | |
| (Written in Words): | (\$ |) |

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

BID DATE: _____

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 for the respective contract being bid on must be completed. Failure to do so can be grounds for disqualification of the bidder.

| ALTERNATES | | | |
|--|---|------|--|
| Contract-Number | Description of Alternate | Cost | |
| Alternate #M-01 Building Management | Provide pricing for open protocol Building Management System (BMS). | \$ | |
| System (BMS) (Contract 'M') | | | |
| | | | |

BID DATE: _____

ADDENDUM

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

| Addendum # | Date | Received by: | Reviewed & Incorporated into Bid by: |
|------------|------|--------------|--------------------------------------|
| <u> </u> | | | |
| | | | |
| | | | |
| | | | |

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 **Thiells Roseville Fire District** reserves the right to award this contract to other than the low bidder.

The Prime 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 Prime 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 the manner and within three hundred & sixty five (365) calendar days 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 <u>and</u> 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.

PROPOSAL: CONTRACT M – HEATING VENTILATION AND AIR CONDITIONING WORK

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

BID DATE: _____

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 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: | |) NIGH | T : (|) |
|------|---|--------|--------------|---|
| | • | | | |

| FAX: | (| |
|------|---|--|
| | | |

Federal I.D. No. or Social Security No. :_____

BID DATE: _____

BASE BID

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 | | |
|---|-----|------------|
| (Written in Words): | (\$ |) |
| ITEM 2 – DIVISION 1 – BONDS AND INSURANCE | | |
| (Written in Words): | (\$ |) |
| ITEM 3 - DIVISION 1 – GENERAL ALLOWANCE | | |
| (Allowance): Eighty Thousand Dollars and Zero Cents | (\$ | 80,000.00) |
| ITEM 3b - DIVISION 1 – UTILITY ALLOWANCE | | |
| (Allowance): Forty Thousand Dollars and Zero Cents | (\$ | 40,000.00) |
| ITEM 4 – DIVISION 26 – ELECTRICAL SITE WORK | | |
| (Written in Words): | (\$ |) |
| ITEM 5 – DIVISION 26 – ELECTRICAL NEW NATURAL GAS GENERATOR | | |
| (Written in Words): | (\$ |) |
| ITEM 6 – DIVISION 26 – ELECTRICAL WORK | | |
| (Written in Words): | (\$ |) |
| ITEM 7 – DIVISION 28 – ELECTRONIC SAFETY AND SECURITY | | |
| (Written in Words): | (\$ |) |
| ITEM 8 – DIVISION 1 – PROJECT CLOSEOUT | | |
| (Written in Words): | (\$ |) |
| ITEM 9 - DIVISION 1 – PROJECT RECORD DOCUMENTS | | |
| (Written in Words): | (\$ |) |
| TOTAL BASE BID (INCLUDING ITEMS 1 THRU 9) | | |
| (Written in Words): | (\$ |) |

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

BID DATE: _____

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 for the respective contract being bid on must be completed. Failure to do so can be grounds for disqualification of the bidder.

| ALTERNATES | | | |
|--|--|------|--|
| Contract-Number | Description of Alternate | Cost | |
| Alternate #E-01 Four-Fold Doors (Contract 'E') | Contract 'E' to provide a 40A/1P circuit breaker with 2 #8 AWG + #10 AWG GND in 1" E.C. feeder for the garage door control panel, "GDCP". Contract 'E' shall power and provide control wiring for motor operator and auxiliary devices from "GDCP " in accordance with the manufacturer's requirements (typical of 5 locations). Contract 'E' shall coordinate with contract 'G'. <u>Note:</u> This alternate is associated with, and will be awarded with Alternate G-01. | \$ | |
| Alternate #E-02 EV Charging Station (Contract 'E') | Contract 'E' to provide one free standing "Charge Point" (Model No. CP600 ac dual port, 80 amp) electric vehicle charging station (or approved equal) as indicated in the Contract Documents. All required equipment, conduit, cable and labor to provide a functioning system shall be included in the alternate price. Base Bid: Provide underground conduit and dragline capped at location of EV charger for future installation by the owner. | \$ | |

H 2 M

BID DATE: _____

| Alternate #E-03 | | |
|---|--|----|
| Fueling Island (Contract 'E') | Contract 'E' to provide feeders, switches and breakers as shown on Contract Documents for fueling island. Base bid shall include underground conduit for power feed and data connections as indicated. Note: This alternate is | \$ |
| | associated with, and will be awarded with alternate P-02. | |
| Alternate #E-04 | | |
| Illuminated Exterior Signage | Contract 'E' to provide pricing to supply power to exterior illuminated building signage as indicated in the contract documents. <u>Note:</u> This alternate is associated with and will be awarded with Alternate G-05. | \$ |
| (Contract 'E') | | |
| Alternate #E-05 | | |
| Upper Level Parking – Lighting and Power | Contract 'E' to provide deduct pricing to omit light fixtures, poles, bases, pole mounted receptacles, power feeds, junction boxes, and conduit for upper level parking lot. Base bid shall include pullbox and conduit shown up to | \$ |
| (Contract 'E') | pullbox on ES 100. <u>Note:</u> This alternate is associated with and will be awarded with Alternate C-01. | |
| Alternate #E-06 | | |
| Gas Booster Pump | Contract 'E' to provide pricing to power gas booster pump and associated accessory options as indicated on contract documents. All equipment, conduit, cable and labor to provide a functioning overtage shall be included in | \$ |
| (Contract 'E') | labor to provide a functioning system shall be included in the alternate price. <u>Note:</u> This alternate is associated with and will be awarded with alternate P-04. | |

PROPOSAL: CONTRACT E - ELECTRICAL CONSTRUCTION WORK

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

| Н | 2 |
|---|---|
| | Μ |

BID DATE: ____

ADDENDUM

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

| Addendum # | Date | Received by: | Reviewed & Incorporated into Bid by: |
|------------|------|--------------|--------------------------------------|
| | | | |
| | | | |
| | | | |

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 **Thiells Roseville Fire District** reserves the right to award this contract to other than the low bidder.

The Prime 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 Prime 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 the manner and within three hundred and sixty five (365) calendar days 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 <u>and</u> 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.

PROPOSAL: CONTRACT E - ELECTRICAL CONSTRUCTION WORK

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

BID DATE: _____

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 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. :_____

BID DATE: _____

BASE BID

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 | | |
|---|---|-------------|
| (Written in Words): | (\$ |) |
| ITEM 2 – DIVISION 1 – BONDS AND INSURANCE | | |
| (Written in Words): | (\$ |) |
| ITEM 3 - DIVISION 1 – GENERAL CIVIL ALLOWANCE | | |
| (Allowance): One Hundred Thousand Dollars and Zero Cents | (\$ | 100,000.00) |
| ITEM 4 – DIVISION 31 – SITE CLEARING | | |
| (Written in Words): | (\$ |) |
| ITEM 5 – DIVISION 31 – EARTHWORK | | |
| (Written in Words): | (\$ |) |
| ITEM 6 – DIVISION 31 – REMOVAL OF EXCESS MATERIALS | | |
| (Written in Words): | (\$ |) |
| ITEM 7 – DIVISION 32 – SITE IMPROVEMENTS | - | - |
| (Written in Words): | (\$ |) |
| ITEM 8 – DIVISIÓN 32 – PORTLAND CEMENT CONCRETE PAVEMENT | , | , |
| & BASE FOR APPARATUS DRIVEWAY | | |
| (Written in Words): | (\$ |) |
| ITEM 9 – DIVISIÓN 32 – PRECAST MODULAR BLOCK RETAINING WALL | | |
| (Written in Words): | (\$ |) |
| ITEM 10 – DIVISION 33 – UTILITIES | • | |
| (Written in Words): | (\$ |) |
| ITEM 11 – DIVISION 33 – SITE DRAINAGE FACILITIES | , | , |
| (Written in Words): | (\$ |) |
| ITEM 12 – NYSDOT – TRAFFIC SIGNAL INSTALLATION | | |
| (Written in Words): | (\$ |) |
| ITEM 13 – NYSDOT – ROADWAY IMPROVEMENTS | | , |
| (Written in Words): | (\$ |) |
| ITEM 14 – DIVISION 1 – PROJECT CLOSEOUT | X · | / |
| (Written in Words): | (\$ |) |
| ITEM 15 - DIVISION 1 – PROJECT RECORD DOCUMENTS | <u>, , , , , , , , , , , , , , , , , , , </u> | / |
| (Written in Words): | (\$ |) |
| | (Ψ |) |
| TOTAL BASE BID (INCLUDING ITEMS 1 THRU 15) | | |
| (Written in Words): | (\$ |) |

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



| Н | 2 |
|---|---|
| | Μ |

BID DATE: _____

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 for the respective contract being bid on must be completed. Failure to do so can be grounds for disqualification of the bidder.

| | ALTERNATES | | | |
|--|---|------|--|--|
| Contract-Number | Description of Alternate | Cost | | |
| Alternate #C-01 Upper Level Parking | Contract 'C' to provide all asphalt paving and sub base, concrete curbing, guide rails, and striping for upper level parking and access road as outlined on CS-100. | \$ | | |
| Area | | | | |
| (Contract 'C') | Base bid shall include retaining wall, concrete stairs, rough grading, all drainage structures and drainage inlets shown in the bid document. | | | |
| Alternate #C-02 | NOT USED | | | |
| Alternate #C-03 Landscaping (Contract 'C') | Contract 'C' to provide plantings as per Drawing LS 100 Landscaping Plan and C 504 Landscape Details. | \$ | | |

BID DATE: _____

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

| Addendum # | Date | Received by: | Reviewed & Incorporated into Bid by: |
|------------|------|--------------|--------------------------------------|
| | | | |
| | | | |
| | | | |
| | | | |

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 Thiells Roseville Fire District reserves the right to award this contract to other than the low bidder.

The Prime 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 Prime 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 the manner and within three hundred & sixty five (365) calendar days 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 <u>and</u> 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.

| PROPOSAL: CONTRACT C - CIVIL / SITE WOR | RK | | |
|--|--|--------------------------|--------|
| THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD | | Н | 2 M |
| GARNERVILLE, NEW YORK 10923 | BID DATE: | | |
| provided by the Architect, then the Architect differential cost of said services, which shall by the Contractor. It shall be the obligation of | tractor is less than the cost of the additional ser ct will be paid the funds held by the Owner plu- be deemed a claim against the Payment Bond pro- the Bonding Company to pay the differential costs v lure to pay these costs within ten (10) days of notific | s the vided within | |
| Bidder: | | | |
| Bidder Address: | | | |
| Signed By: | Title: | | |

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: | (| |
|------|---|--|
| | | |

Date:

Federal I.D. No. or Social Security No. :_____

PROPOSAL:



THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

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 |
|-----------------------------|---------|
| | |
| | |
| | |
| | |
| | |
| | |
| Name of Bidder: | |
| | |
| Business Address of Bidder: | |
| | |

PROPOSAL:

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923

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:

THIELLS ROSEVILLE FIRE DISTRICT NEW 26-100 FIRE HEADQUARTERS 65 W RAMAPO ROAD GARNERVILLE, NEW YORK 10923



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 Thiells Roseville Fire District. 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 Thiells Roseville Fire District 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.

Ву: _

(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:

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

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 Wo | ork: | | | | | |
| <u>Owner</u> | <u>Contact Name</u> | Phone Number | <u>Location</u> | Contract Amount | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |



| Subcontractor Name: | | | | | | |
|---------------------|--------------|--------------|-----------------|-----------------|--|--|
| Type of Wo | ork: | | | | | |
| <u>Owner</u> | Contact Name | Phone Number | <u>Location</u> | Contract Amount | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| <u>Subcontrac</u> | ctor Name: | | | | | |
| Type of Wo | ork: | | | | | |
| <u>Owner</u> | Contact Name | Phone Number | <u>Location</u> | Contract Amount | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |



| Subcontractor Name: | | | | | | | |
|---------------------|--------------|--------------|-----------------|-----------------|--|--|--|
| Type of Work: | | | | | | | |
| <u>Owner</u> | Contact Name | Phone Number | <u>Location</u> | Contract Amount | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Subcontrac | ctor Name: | | | | | | |
| Type of Wo | ork: | | | | | | |
| <u>Owner</u> | Contact Name | Phone Number | <u>Location</u> | Contract Amount | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |



IN ACCORDANCE WITH ARTICLE 8, SECTION 220 (3-a) OF THE NEW YORK STATE LABOR LAW THE FOLLOWING PAGES REPRESENT THE MOST CURRENT PREVAILING WAGE RATE SCHEDULES AT THE OF BIDDING, ISSUED BY THE NEW YORK STATE DEPARTMENT OF LABOR SPECIFICALLY REQUESTED FOR THIS PROJECT:

- WAGE RATE SCHEDULE
- LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED PUBLIC WORK

PRC#: 2024015694- New 26-100 Fire Headquarters

https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1581516

THIELLS ROSEVILLE FIRE DISTRICT 99 WEST RAMAPO ROAD GARNERVILLE, NEW YORK 10923



IN ACCORDANCE WITH ARTICLE 8, SECTION 220 (3-a) OF THE NEW YORK STATE LABOR LAW THE FOLLOWING PAGES REPRESENT THE MOST CURRENT PREVAILING WAGE RATE SCHEDULES AT THE OF BIDDING, ISSUED BY THE NEW YORK STATE DEPARTMENT OF LABOR SPECIFICALLY REQUESTED FOR THIS PROJECT:

- WAGE RATE SCHEDULE
- LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED PUBLIC WORK

PRC#: 2024015694- New 26-100 Fire Headquarters

https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1581516

THIELLS ROSEVILLE FIRE DISTRICT 99 WEST RAMAPO ROAD GARNERVILLE, NEW YORK 10923

Roberta Reardon, Commissioner

Kathy Hochul, Governor



Thiells Roseville Fire Distric

Keyuri Patel H2M architect & engineers 538 Broad Hollow Road Melville NY 11747 Schedule Year Date Requested 12/27/2024 PRC#

2024 through 2025 2024015694

65 W Ramapo Road Location **TRFD 2302** Proiect ID# Project Type New 2-Story Building and Site Work

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2024 through June 2025. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice. **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed:

Date Cancelled:

Name & Title of Representative:

Phone: (518) 457-5589 Fax: (518) 485-1870 W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemperaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment. Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8. Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220e(b)). The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of \$50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Roberta Reardon, Commissioner

Kathy Hochul, Governor



Thiells Roseville Fire Distric

Keyuri Patel H2M architect & engineers 538 Broad Hollow Road Melville NY 11747 Schedule Year Date Requested PRC#

2024 through 2025 12/27/2024 2024015694

Location65 W Ramapo RoadProject ID#TRFD 2302Project TypeNew 2-Story Building and Site Work

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

| | | State: | Zip: |
|-----------|---|--------|--|
| <u>\$</u> | | | Contract Type: |
| | | | [] (01) General Construction |
| | 1 | | |
| / | / | | [] (02) Heating/Ventilation |
| / | | | [] (02) Heating/Ventilation [] (03) Electrical [] (04) Plumbing |
| | | | State: |

Contractor Information All information must be supplied

Phone: (518) 457-5589 Fax: (518) 485-1870 W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to \$1,500 for a first offense and up to \$5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage

If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: <u>dol.misclassified@labor.ny.gov</u>.

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor Administrative Finance Bureau-PWEF Unit Building 12, Room 464 State Office Campus Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.



Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, and
- You perform work that is not part of the usual work done by the business that hired you, and
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.

Penalties for paying workers off the books or improperly treating employees as independent contractors:

| Civil Penalty | First offense: Up to \$2,500 per employee |
|------------------|--|
| | Subsequent offense(s): Up to \$5,000 per employee |
| Criminal Penalty | First offense: Misdemeanor - up to 30 days in jail, up to a \$25,000 fine and debarment from performing public work for up to one year. |
| | Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a \$50,000 fine and debarment from performing public work for up to 5 years. |

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to <u>dol.misclassified@labor.ny.gov</u>. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name: IA 999 (09/16)

WE ARE YOUR DOL



New York State Department of Labor Bureau of Public Work

Attention Employees

THIS IS A:

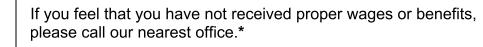
PUBLIC WORK PROJECT

If you are employed on this project as a **worker**, **laborer**, **or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work



Albany(518Binghamton(607Buffalo(716Garden City(516New York City(212Newburgh(845

(518) 457-2744 (607) 721-8005 (716) 847-7159 (516) 228-3915 (212) 932-2419 (845) 568-5287

Patchogue Rochester Syracuse Utica White Plains (631) 687-4882 (585) 258-4505 (315) 428-4056 (315) 793-2314 (914) 997-9507

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or <u>www.comptroller.nyc.gov</u> – click on Bureau of Labor Law.

Contractor Name:

Project Location:

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is \$250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training "prior to the performing any work on the project."

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (Note: Completion cards do not have an expiration date.)
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is \$3 million in Bronx, Kings, New York, Queens and, Richmond counties; \$1.5 million in Nassau, Suffolk and Westchester counties; and \$500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stopbid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a countyby-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

| Title (Trade) | Ratio |
|--|---------|
| Boilermaker (Construction) | 1:1,1:4 |
| Boilermaker (Shop) | 1:1,1:3 |
| Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder) | 1:1,1:4 |
| Carpenter (Residential) | 1:1,1:3 |
| Electrical (Outside) Lineman | 1:1,1:2 |
| Electrician (Inside) | 1:1,1:3 |
| Elevator/Escalator Construction & Modernizer | 1:1,1:2 |
| Glazier | 1:1,1:3 |
| Insulation & Asbestos Worker | 1:1,1:3 |
| Iron Worker | 1:1,1:4 |
| Laborer | 1:1,1:3 |
| Mason | 1:1,1:4 |
| Millwright | 1:1,1:4 |
| Op Engineer | 1:1,1:5 |
| Painter | 1:1,1:3 |
| Plumber & Steamfitter | 1:1,1:3 |
| Roofer | 1:1,1:2 |
| Sheet Metal Worker | 1:1,1:3 |
| Sprinkler Fitter | 1:1,1:2 |
| | |

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor Bureau of Public Work State Office Campus, Bldg. 12 Albany, NY 12226

| District Office Locations: | Telephone # | FAX # |
|--|--------------|--------------|
| Bureau of Public Work - Albany | 518-457-2744 | 518-485-0240 |
| Bureau of Public Work - Binghamton | 607-721-8005 | 607-721-8004 |
| Bureau of Public Work - Buffalo | 716-847-7159 | 716-847-7650 |
| Bureau of Public Work - Garden City | 516-228-3915 | 516-794-3518 |
| Bureau of Public Work - Newburgh | 845-568-5287 | 845-568-5332 |
| Bureau of Public Work - New York City | 212-932-2419 | 212-775-3579 |
| Bureau of Public Work - Patchogue | 631-687-4882 | 631-687-4902 |
| Bureau of Public Work - Rochester | 585-258-4505 | 585-258-4708 |
| Bureau of Public Work - Syracuse | 315-428-4056 | 315-428-4671 |
| Bureau of Public Work - Utica | 315-793-2314 | 315-793-2514 |
| Bureau of Public Work - White Plains | 914-997-9507 | 914-997-9523 |
| Bureau of Public Work - Central Office | 518-457-5589 | 518-485-1870 |

Rockland County General Construction

Boilermaker

JOB DESCRIPTION Boilermaker

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester WACES

| Per Hour: | 07/01/2024 | 01/01/2025 |
|-----------------------|------------|------------|
| Boilermaker | \$ 67.38 | \$ 68.88 |
| Repairs & Renovations | 67.38 | 68.88 |

Repairs & Renovation: Includes Repairing, Renovating replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS

Per Hour:

| Boilermaker | 33.5% of hourly | 33.5% of Hourly |
|----------------------|-----------------|-----------------|
| Repair & Renovations | Wage Paid | Wage Paid |
| | + \$ 26.85 | + \$26.85 |

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

OVERTIME PAY

See (*B, O, **U) on OVERTIME PAGE

Note:* Includes 9th & 10th hours, double for 11th or more.

** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

| HOLIDAY | |
|-----------|--|
| Paid: | See (1) on HOLIDAY PAGE |
| Overtime: | See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE |

REGISTERED APPRENTICES

Wage per hour:

(1/2) Year Terms at the following percentage of Boilermaker's Wage

| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th |
|-----|-----|-----|-----|-----|-----|-----|
| 65% | 70% | 75% | 80% | 85% | 90% | 95% |

Supplemental Benefits Per Hour:

| | 33.5% of Hourly Wage Paid Plus Amount Below | 33.5% of Hourly Wage Paid Plus Amount Below |
|----------|---|---|
| 1st Term | \$ 20.36 | \$ 20.36 |
| 2nd Term | 21.28 | 21.28 |
| 3rd Term | 22.22 | 22.22 |
| 4th Term | 23.12 | 23.12 |
| 5th Term | 24.07 | 24.07 |
| 6th Term | 25.00 | 25.00 |
| 7th Term | 25.93 | 25.93 |

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

Carpenter

JOB DESCRIPTION Carpenter

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

12/01/2024

DISTRICT 4

12/01/2024

4-5

| Piledriver | \$ 60.59 + 10.00* | |
|----------------------|----------------------|---|
| Dockbuilder | \$ 60.59 + 10.00* | |
| *This portion of the | | o the SAME PREMIUM as shown for overtime. |

MENTAL BENEFITS

Per hour:

Journeyworker \$45.79

OVERTIME PAY

See (B, E2, O) on OVERTIME PAGE

HOLIDAY Paid:

See (1) on HOLIDAY PAGE.

| Paid: for 1st & 2nd yr. | |
|-------------------------|--|
| Apprentices | |

See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour

| (1)year terms: | | | | |
|----------------|---------|---------|---------|---------|
| | 1st | 2nd | 3rd | 4th |
| | \$26.98 | \$32.58 | \$40.96 | \$49.35 |
| | + 5.50* | + 5.50* | + 5.50* | + 5.50* |

\$ 32.34

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

All Terms:

8-1556 Db

12/01/2024

Carpenter

JOB DESCRIPTION Carpenter

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

07/01/2024 Per hour:

Carpet/Resilient Floor Coverer

\$ 55.05 + 8.25*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS

Per hour:

\$ 39.45

OVERTIME PAY See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE.

Paid for 1st & 2nd yr. Apprentices See (5,6,11,13,16,18,19,25) Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wage per hour - (1) year terms:

| 1st | 2nd | 3rd | 4th |
|----------|----------|----------|----------|
| \$ 25.20 | \$ 28.20 | \$ 32.45 | \$ 40.33 |

| Prevailing Wage Rates for Last Published on Dec 01 | | 0/2025 | | | Published by the New York State Department of Labo PRC Number 2024015694 Rockland Count |
|---|--------------------------------|--------------------------------|------------------------|------------------|--|
| | + 1.85* | + 2.35* | + 2.85* | + 3.85* | |
| This portion of the bene | efit is NOT subject | to the SAME | PREMIUM as | shown for overti | me. |
| Supplemental benefits p | ber hour: | | | | |
| | 1st | 2nd | 3rd | 4th | |
| | \$ 15.22 | \$ 16.22 | \$ 19.32 | \$ 20.32 | 8-228 |
| Carpenter | | | | | 12/01/2024 |
| JOB DESCRIPTION | Carpenter | | | | DISTRICT 8 |
| ENTIRE COUNTIES Bronx, Dutchess, Kings, | , Nassau, New Yo | rk, Orange, Pı | utnam, Queen | s, Richmond, Ro | ckland, Suffolk, Westchester |
| WAGES | | | | | |
| Per Hour: | 07/01/2024 | | | | |
| Marine Construction: | | | | | |
| Marine Diver | \$ 75.46 + 10.00* | | | | |
| Marine Tender | \$ 55.00 + 10.00* | | | | |
| [*] This portion of the bene SUPPLEMENTAL BE Per Hour: | | t to the SAME | PREMIUM as | shown for overti | me |
| Journeyworker | \$ 45.65 | | | | |
| OVERTIME PAY See (B, E, E2, Q) on O∖ | /ERTIME PAGE | | | | |
| HOLIDAY Paid: Overtime: | See (18, 19) See (5, 6, 11, | on HOLIDAY F 13, 16, 18, 19 | PAGE 9, 25) on HOLI | DAY PAGE | |
| REGISTERED APPR Wages per hour: One (1) year terms. | ENTICES | | | | |
| 1st year | \$ 26.98 + 5.50* | | | | |
| 2nd year | 32.58 | | | | |
| 3rd year | + 5.50* 40.96 | | | | |
| 4th year | + 5.50* 49.35 + 5.50* | | | | |
| *This portion of the bene | efit is NOT subject | t to the SAME | PREMIUM as | shown for overti | me. |
| Supplemental Benefits Per Hour: | | | | | |
| All terms | \$ 32.20 | | | | 8-1456M0 |
| Carpenter | | | | | 12/01/2024 |
| | | | | | 12/01/2024 |
| JOB DESCRIPTION | O B B B B B B B B B B | | | | DISTRICT 8 |

WAGES Per hour:

07/01/2024

Building Millwright \$ 59.35 + 13.12*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS

Per hour:

Millwright

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY Paid:

See (18, 19) on HOLIDAY PAGE See (18,19) on HOLIDAY PAGE.

\$45.41

Overtime

Paid:

See (5,6,8,11,13,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES Wages per hour:

One (1) year terms:

| 1st. | 2nd. | 3rd. | 4th. |
|----------|----------|----------|----------|
| \$ 32.16 | \$ 37.61 | \$ 43.06 | \$ 53.96 |
| + 7.08* | + 8.25* | + 9.42* | + 11.76* |

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

One (1) year terms:

| 1st. | 2nd. | 3rd. | 4th. |
|----------|----------|----------|----------|
| \$ 30.56 | \$ 33.09 | \$ 36.27 | \$ 40.69 |

Carpenter

JOB DESCRIPTION Carpenter

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES

Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.

Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border. Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

| WAGES Per hour: | 07/01/2024 |
|---------------------------|---------------------|
| Core Drilling: Driller | \$ 46.25 + 3.25* |
| Driller Helper | \$ 36.28 + 3.25* |

Note: Hazardous Waste Pay Differential:

For Level C, an additional 15% above wage rate per hour

For Level B, an additional 15% above wage rate per hour

For Level A, an additional 15% above wage rate per hour

Note: When required to work on water: an additional \$ 3.00 per hour.

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

\$ 30.24

SUPPLEMENTAL BENEFITS

Per hour:

Driller and Helper OVERTIME PAY **DISTRICT** 8

8-740.1

12/01/2024

See (B, G, P) on OVERTIME PAGE

| HOLIDAY | |
|-----------|----------------------------|
| Paid: | See (5, 6) on HOLIDAY PAGE |
| Overtime: | See (5, 6) on HOLIDAY PAGE |

8-1536-CoreDriller

12/01/2024 Carpenter - Building / Heavy&Highway JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 11 **ENTIRE COUNTIES** Putnam, Rockland, Westchester WAGES WAGES:(per hour) Applies to CAPRENTER BUILDING/HEAVY & HIGHWAY/TUNNEL: 07/01/2026 07/01/2024 07/01/2025 Additional Additional Base Wage \$42.76 \$ 1.25** \$ 1.25** +\$6.62* *For all hours paid straight or premium.

**To be allocated at a later date.

SHIFT WORK

SHIFT DIFFERENTIAL: When it is mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of wage plus applicable benefits.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$31.60

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

 BUILDING:

 Paid:
 See (1) on HOLIDAY PAGE.

 Overtime:
 See (5, 6, 16, 25) on HOLIDAY PAGE.

 - Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:

Paid: See (5, 6, 25) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

- Holidays that fall on Sunday will be observed Monday

- Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay

- If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES

1 year terms at the following wage rates:

| 1st | 2nd | 3rd | 4th | |
|---|----------|----------|----------|--|
| \$ 21.38 | \$ 25.66 | \$ 29.93 | \$ 34.21 | |
| +3.84* | +3.84* | +3.84* | +3.84* | |
| *For all hours paid straight or premium | | | | |

\$16.25

SUPPLEMENTAL BENEFITS per hour:

All terms

11-279.1B/HH

Electrician

JOB DESCRIPTION Electrician

ENTIRE COUNTIES Orange, Putnam, Rockland 12/01/2024

Dutchess: Towns of Fishkill, East Fishkill, and Beacon.

WAGES

Per hour:

| i ei noui. | |
|--------------------------------|------------|
| | 07/01/2024 |
| Electrician Wireman/Technician | \$ 50.50 |
| | + 9.50* |

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):

- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional \$2.00 per hour above the regular straight time rate.

- Journeyman Wireman working in Shafts, Tunnels or on Barges: \$5.00 above the Journeyman Wireman rate of pay

- Journeyman Wireman when performing welding or cable splicing: \$3.00 above the Journeyman Wireman rate of pay

- Journeyman Wireman required to have a NYS Asbestos Certificate: \$3.00 above the Journeyman Wireman rate of pay

- Journeyman Wireman required to have a CDL: \$3.00 above the Journeyman Wireman rate of pay.

SHIFT WORK

SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply when shift is worked:

| Per hour: | 07/01/2024 |
|--------------------------|------------|
| SUPPLEMENTAL BENEFITS | |
| | + 9.50* |
| Between 12:30am & 8:30am | \$66.35 |
| | + 9.50* |
| Between 4:30pm & 12:30am | \$ 59.30 |

| Per hour: | 07/01/2024 |
|------------|-----------------|
| Journeyman | \$ 29.68 plus |
| | 3% of straight |
| | or premium wage |

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES

WAGES:

(1)year terms at the following rates

| 07/01/2024 | 1.01 | Ond | 3rd | 4+6 | 5th | 6th |
|------------|----------|------------|----------|----------|----------|----------|
| | 1st | 2nd | | 4th | | |
| 1st Shift | \$ 16.01 | \$ 19.40 | \$ 24.25 | \$ 29.10 | \$ 33.95 | \$ 36.38 |
| | +1.00* | +1.00* | +1.50* | +2.00* | +2.50* | +2.50* |
| 2nd Shift | 18.78 | 22.76 | 28.45 | 34.13 | 39.82 | 42.67 |
| | +1.00* | +1.00* | +1.50* | +2.00* | +2.50* | +2.50* |
| 3rd Shift | 21.04 | 25.49 | 31.86 | 38.24 | 44.61 | 47.80 |
| | +1.00* | +1.00* | +1.50* | +2.00* | +2.50* | +2.50* |
| 00/04/0004 | | . . | <u> </u> | 4.11 | | 0.1 |
| 09/01/2024 | 1st | 2nd | 3rd | 4th | 5th | 6th |
| 1st Shift | \$ 16.01 | \$ 19.40 | \$ 24.25 | \$ 29.10 | \$ 33.95 | \$ 36.38 |
| | +1.00* | +1.00* | +1.00* | +2.00* | +2.50* | +2.50* |
| 2nd Shift | 18.78 | 22.76 | 28.45 | 34.13 | 39.82 | 42.67 |
| | +1.00* | +1.00* | +1.00* | +2.00* | +2.50* | +2.50* |
| 3rd Shift | 21.04 | 25.49 | 31.86 | 38.24 | 44.61 | 47.80 |
| | +1.00* | +1.00* | +1.00* | +2.00* | +2.50* | +2.50* |
| 04/01/2025 | 1st | 2nd | 3rd | 4th | 5th | 6th |
| | | \$ 19.80 | | | | |
| 1st Shift | \$ 16.34 | | \$ 24.75 | \$ 29.70 | \$ 34.65 | \$ 37.13 |
| | +1.00* | +1.00* | +1.00* | +2.00* | +2.50* | +2.50* |
| 2nd Shift | 19.17 | 23.23 | 29.03 | 34.84 | 40.64 | 43.55 |
| | +1.00* | +1.00* | +1.00* | +2.00* | +2.50* | +2.50* |
| 3rd Shift | 21.47 | 26.02 | 32.52 | 39.03 | 45.53 | 48.79 |
| | +1.00* | +1.00* | +1.00* | +2.00* | +2.50* | +2.50* |
| | | | | | | |

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:

| JOB DESCRIPTION Elevator | Constructor | DISTRICT 4 | |
|--------------------------|--|------------|------------|
| Elevator Constructor | | | 12/01/2024 |
| | | | 11-363/1 |
| 6th term | \$ 21.28 plus 3% of straight or premium wage | | |
| 5th term | \$ 21.28 plus 3% of straight or premium wage | | |
| 4th term | \$ 19.78 plus 3% of straight or premium wage | | |
| 3rd term | \$ 18.78 plus 3% of straight or premium wage | | |
| 2nd term | \$ 17.78 plus 3% of straight or premium wage | | |
| 1st term | \$ 16.28 plus 3% of straight or premium wage | | |
| 09/01/2024 | | | |
| 6th term | \$ 20.28 plus 3% of straight or premium wage | | |
| 5th term | \$ 20.28 plus 3% of straight or premium wage | | |
| 4th term | \$ 18.78 plus 3% of straight or premium wage | | |
| 3rd term | \$ 18.28 plus 3% of straight or premium wage | | |
| 2nd term | \$ 16.28 plus 3% of straight or premium wage | | |
| 1st term | \$ 16.28 plus 3% of straight or premium wage | | |
| 07/01/2024 | | | |

JOB DESCRIPTION Elevator Constructor

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES Rockland: Entire County except for the Township of Stony Point Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

| WA | GES |
|----|-----|
|----|-----|

| WAGES Per hour: | | | | |
|--|----------------------------|--|-----------------------|-----------------------|
| | 07/01/20 |)24 | 03/17/2025 | |
| Elevator Constructor | \$ 80.35 | 5 | \$ 83.37 | |
| Modernization & Service/Repair SUPPLEMENTAL BENE Per Hour: | 63.16 | 5 | 65.54 | |
| Elevator Constructor | \$ 46.36 | 37 | \$ 47.654 | |
| Modernization & Service/Repairs OVERTIME PAY Constructor See (D, M, T) | 45.21 on OVERTIME PAGE. | 7 | 46.470 | |
| Modern/Service See (B, F, | , S) on OVERTIME PAG | Ε. | | |
| HOLIDAY Paid: Overtime: REGISTERED APPREN WAGES PER HOUR: | See (5, 6, 8, 11, 15, 16, | 25) on HOLIDAY PAGE 25) on HOLIDAY PAGE | | |
| 6 MONTH TERMS: | | | | |
| 1st Term* 50% | 2nd & 3rd Term* 50% | 4th & 5th Term 55% | 6th & 7th Term 65% | 8th & 9th Term 75% |
| * Note: 1st, 2nd, 3rd Terms are based on Average of the Constructor, the Modernization and the Service/Repair wage. Terms 4 thru 9 Based on Journeyman's wage of classification Working in. | | | | |

| SUPPLEMENTAL BENEFITS: | | |
|------------------------|------------|------------|
| | 07/01/2024 | 03/17/2025 |
| Elevator Constructor | | |
| 1st Term | \$ 0.00 | \$ 0.00 |
| 2nd & 3rd Term | 36.15 | 36.90 |

| Glazier | | | | | | 12/01/202 |
|--|--|-------------------------|--|-----------------|---|-----------------------------|
| Jame as JO | urneyperson/ | ויפואפו | | | | 1-13 |
| | - | er hour worke Helper | d: | | | |
| , | | | onal suppleme | ental benefits. | | |
| 0 % | 55 % | 65 % | 70 % | 80 % | | |
| /ages per h -6 mo* | | 2nd yr | 3rd yr | 4th yr | | |
| londay. | | | • | | | |
| 'aid:)vertime: lote: When | a paid holida | See (5, 6, | 15, 16) on HC 15, 16) on HC turday, it shall | LIDAY PAGE | on Friday. When a paid holiday falls on Sund | ay, it shall be observed on |
| IOLIDAY | | | | | | |
| VERTIME | • | | | | | |
| *)Plus 6% c | if regular hou | | | ervice Plus 8% | 6 of regular hourly rate if more than 5 years o | fservice |
| lourneyworł | ker/Helper | \$ 37.88 | | | \$ 38.435* | |
| Per hour | | 07/01/20 | 24 | | 01/01/2025 | |
| | ENTAL BEN | Wage Rat NEFITS | e | | Wage Rate | |
| lelper | | 70% of Me | echanic | | 70% of Mechanic | |
| lechanic | | \$ 70.15 | | | \$ 73.07 | |
| VAGES Per Hour | | 07/01/20 | 24 | | 01/01/2025 | |
| elaware: 1 lancock & 3 lockland: 0 | owns of And Stamford Only the Towr | nship of Stony | / Point. | | , Harpersfield, Hemdon, Kortright, Meredith, M d, Mt. Kisco, North Salem, Pound Ridge, Som | |
| Columbia, D | | ene, Orange, | Putnam, Sulli | van, Ulster | | |
| OB DESC | | levator Cons | tructor | | DISTRICT | 1 |
| Elevator C | onstructor | | | | | 12/01/202 |
| | | | -01 | | T.TO | 4- |
| th & 7th Te th & 9th Te | rm | | 38.80 40.41 | | 39.70 41.40 | |
| nd & 3rd Te th & 5th Te | | | 36.15 37.19 | | 36.90 37.99 | |
| /lodernizatio Service/Rep st Term | | | \$ 0.00 | | \$ 0.00 | |
| th & 9th Te | rm | | 40.41 | | 41.40 | |
| th & 7th Te | | | 38.80 | | 39.70 | |
| | rm | | 38 80 | | 30.70 | |

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES Per hour:

| 07/01/2024 | 05/01/2025 |
|------------|------------|
| 01/01/2024 | |
| | Additional |
| \$ 63.28 | \$ 1.11*** |
| | Page 27 |

| and Window Film Scaffolding, including | 67.28 |
|---|-------|
| swing scaffold | |
| *Mechanical Equipment | 64.28 |
| **Repair & Maintenance | 30.76 |

*Mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.

**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under \$193,000.

***To be allocated at a later date.

| SUPPLEMENTAL BENEFITS | |
|--|-----------|
| Per hour: | 7/01/2024 |
| Glazier, Glass Tinting Window Film, Scaffolding and Mechanical Equipment | \$ 42.13 |
| Repair & Maintenance | 24.62 |

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY

See (5, 6, 16, 25) on HOLIDAY PAGE See (5, 6, 16, 25) on HOLIDAY PAGE Paid: Overtime: For 'Repair & Maintenance' Paid: See(5, 6, 16, 25) Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES

Wage per hour:

| · / · | Ū | 0 | 7/01/2024 |
|--|---|---|-------------------------------------|
| 1st term 2nd term 3rd term 4th term | | | \$ 22.34 30.64 40.87 50.14 |
| Supplemental Benefits: (Per hour) 1st term 2nd term 3rd term 4th term | | | \$ 19.27 27.34 32.85 36.01 |

Insulator - Heat & Frost

8-1087 (DC9 NYC)

12/01/2024

| JOB DESCRIPTION Insulate ENTIRE COUNTIES Dutchess, Orange, Putnam, Ro | | DISTRICT 8 |
|---|------------|------------|
| WAGES Per hour: | 07/01/2024 | |
| Insulator | \$ 60.85 | |
| Discomfort & Additional Training** | 63.92 | |
| Fire Stop Work* | 32.97 | |

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring; garb or equipment worn against the body not customarily worn by insulators; psychological evaluation ;special training, including but not limited to "Yellow Badge" radiation training

Note: Additional \$0.50 per hour for work 30 feet or more above floor or ground level.

| SUPPLEMENTAL BENEFITS |
|-----------------------|
| Per hour: |
| |

| Journeyworker | \$ 38.25 |
|---------------------|----------|
| Discomfort & | |
| Additional Training | 40.32 |
| Fire Stop Work: | |
| Journeyworker | 19.48 |

OVERTIME PAY

See (B, E, E2, Q, *T) on OVERTIME PAGE

HOLIDAY

See (1) on HOLIDAY PAGE Paid:

Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

See (2*, 4, 6, 16, 25) on HOLIDAY PAGE. Overtime: *Note: Labor Day triple time if worked.

REGISTERED APPRENTICES

(1) year terms:

Insulator Apprentices:

| 1st | 2nd | 3rd | 4th |
|----------|----------|----------|----------|
| \$ 32.97 | \$ 38.54 | \$ 44.12 | \$ 49.70 |

| Discomfort & Additional Training Apprentices: | | | |
|---|----------|----------|----------|
| 1st | 2nd | 3rd | 4th |
| \$ 34.51 | \$ 40.38 | \$ 46.27 | \$ 52.16 |

Supplemental Benefits paid per hour:

| Insulator Apprentices: | |
|------------------------|----------|
| 1st term | \$ 19.48 |
| 2nd term | 23.23 |
| 3rd term | 26.98 |
| 4th term | 30.74 |
| | |

| Discomfort & Additional Training Apprentices | 8: |
|--|----------|
| 1st term | \$ 20.50 |
| 2nd term | 24.47 |
| 3rd term | 28.43 |
| 4th term | 32.39 |

8-91

12/01/2024

Ironworker

JOB DESCRIPTION Ironworker

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES

Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

| WAGES Per hour: | 07/01/2024 |
|--------------------------------|-----------------------|
| Reinforcing & Metal Lathing | \$ 56.95 |
| "Base" Wage | 55.20 plus \$ 1.75 |

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS Dor hou

| Per nour. | |
|---------------|----------|
| Reinforcing & | \$ 44.63 |

Metal Lathing

OVERTIME PAY

| See (B, E, Q, *X) on OVERTIME PAGE |
|---|
| *Only \$23.50 per Hour for non worked hours |

Supplemental Benefit Premiums for Overtime Hours worked:

| Time & One Half | \$ 51.13 | | |
|-------------------------------|--|--|--|
| Double Time | 57.63 | | |
| HOLIDAY Paid: Overtime: | See (1) on HOLIDAY PAGE See (5, 6, 11, 13, *18, **19, 25) on HOLIDAY PAGE | | |
| REGISTERED APPRENTICES | | | |

(1) year terms at the following wage rates:

| Prior to 01/01/2020: 1st term | 2nd term | 3rd term | 4th Term |
|---|------------------------|------------------------|------------------------|
| Wage Per Hour: \$ 22.55 "Base" Wage | \$ 28.38 | \$ 34.68 | \$ 37.18 |
| \$21.00 plus \$1.55 | \$26.80 plus \$1.58 | \$33.10 plus \$1.58 | \$35.60 plus \$1.58 |

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS Per Hour:

| 1st term | 2nd term | 3rd term | 4th Term |
|---|-------------|-------------|-------------|
| \$18.17 | \$21.34 | \$22.00 | \$22.50 |
| After 01/01/2020: 1st term | 2nd term | 3rd term | 4th Term |
| Wage Per Hour: \$ 22.55 "Base" Wage | \$ 23.60 | \$ 24.60 | \$ 25.65 |
| \$21.00 | \$22.00 | \$23.00 | \$24.00 |
| plus \$1.55 | plus \$1.60 | plus \$1.60 | plus \$1.65 |

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS

Per Hour:

| | 4th Term | 3rd term | 2nd term | 1st term |
|-----------|----------|----------|--------------------|----------|
| | \$15.45 | \$16.45 | \$17.40 | \$18.40 |
| 4-46Reinf | ••••• | ••••• | • • • • • • | |

Ironworker

JOB DESCRIPTION Ironworker

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster

WAGES Per hour

| Per nour. | | | |
|------------------|------------|------------|------------|
| | 07/01/2024 | 07/01/2025 | 07/01/2026 |
| | | Additional | Additional |
| Structural | \$ 51.38 | \$ 2.00* | \$2.00* |
| Reinforcing | 51.38 | 2.00* | 2.00* |
| Ornamental | 51.38 | 2.00* | 2.00* |
| Chain Link Fence | 51.38 | 2.00* | 2.00* |
| | | | |

* To be allocated at a later date.

DISTRICT 11

12/01/2024

NOTE: For Reinforcing classification ONLY, Ironworker 4-46Reinf rates apply in Rockland County's southern section (south of Convent Road and east of Blue Hills Road).

SHIFT WORK On Government Mandated Irregular Workdays or Shift Work, the following wage will be paid: 1st Shift \$ 51.38 2nd Shift 66.39 3rd Shift 71.39 Note- Any shift that works past 12:00 midnight shall receive the 3rd shift differential. SUPPLEMENTAL BENEFITS

SUPPLEMENTAL BENEFITS

Per hour:

\$ 45.56

Journeyman OVERTIME PAY

See (B1, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE Overtime: See (5, 6, 16) on HOLIDAY PAGE

If a holiday falls on Saturday, it will be observed Friday. If a holiday falls on Sunday, it will be observed Monday.

REGISTERED APPRENTICES

Wages:

(1) year terms at the following wage:

| | 1st yr | 2nd yr | 3rd yr | 4th yr |
|-----------------------|-------------|------------|----------|---------|
| 1st Shift | \$ 25.69 | \$ 30.83 | \$ 35.97 | \$41.10 |
| 2nd Shift | 36.15 | 42.20 | 48.25 | 54.29 |
| 3rd Shift | 39.64 | 45.99 | 52.35 | 58.69 |
| | | | | |
| Supplemental Benefits | s per hour: | | | |
| | • | 07/01/2024 | | |

| | 07/01/2024 |
|----------|------------|
| 1st year | \$ 40.94 |
| 2nd year | 41.86 |
| 3rd year | 42.79 |
| 4th year | 43.71 |
| | |

Laborer - Building

JOB DESCRIPTION Laborer - Building

ENTIRE COUNTIES

Rockland

WAGES

Class 1: Custodial and janitorial work, general cleanup, and flag person.

Class 2: Concrete laborer, mason tending, hod carrier, signal person, pressure blasting and washing, chainsaw, demo saw, jackhammers, general labor.

Class 3: Jumping jack, air track drills, grading, explosive handler and blaster, grade checker. When OSHA requires negative pressure respirator.

Class 4: Environmental work including but not limited to asbestos abatement, toxic and hazardous abatement, lead abatement work, mold remediation and biohazards.

| WAGES: (per hour) | 07/01/2024 | 06/01/2025 | 06/01/2025 |
|-------------------|------------|------------|------------|
| | | Additional | Additional |
| Class 1 | \$ 43.74 | \$ 2.60* | \$ 2.69* |
| Class 2 | 46.96 | 2.71* | 2.81* |
| Class 3 | 48.13 | 2.75* | 2.85* |
| Class 4 | 49.36 | 2.80* | 2.89* |

*To be allocated at a later date.

NOTE: All work five feet or more outside the building foundation line shall be deemed Heavy & Highway

SHIFT WORK

DISTRICT 11

12/01/2024

11-417

Shift Differential: On all Governmental mandated irregular or off shift work, an additional 25% of wage is required. The 25% shift differential will be paid on public works contract for shifts or irregular workdays outside the normal working hours for 2nd and 3rd shifts or irregular workday or when mandated or required by state, federal, county, local or other governmental agency contracts.

SUPPLEMENTAL BENEFITS

Per Hour:

| Journeyman | \$ 30.35 |
|--------------------|----------|
| Shift Differential | \$ 37.22 |

OVERTIME PAY

See (B, *E, E5, **Q) on OVERTIME PAGE

*For first 8 hours on Saturday

**When an employee is required to work on a holiday which falls on a Sunday the employee shall be paid three (3) times the hourly rate and one (1) hour benefits for every hour worked. When an employee is required to work on a holiday which falls on a Saturday the employee shall be paid two and a half (2.5) times the hourly rate and one hour benefits for every hour worked.

HOLIDAY

| Paid: | See (1) on HOLIDAY PAGE. |
|-----------|-------------------------------------|
| Overtime: | See (5, 6, 16, 25) on HOLIDAY PAGE. |

REGISTERED APPRENTICES

| (1000) | hour terms at the following wages. |
|--------|------------------------------------|
|--------|------------------------------------|

| | 07/01/2024 |
|--|-------------------|
| 1st term | \$ 28.05 |
| 2nd term | 32.35 |
| 3rd term | 36.70 |
| 4th term | 41.00 |
| Supplemental Benefits per hour: All Terms Regular All Terms Shift Rate | \$ 29.40 34.79 |

11-754B

12/01/2024

Laborer - Heavy&Highway

JOB DESCRIPTION Laborer - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES Rockland

WAGES

CLASS 1: Flag person, gate person.

CLASS 2: General laborer, chuck tender, nipper, powder carrier, magazine tender, concrete men, vibrator men, mason tender, mortar men, traffic control, custodial work, temporary heat, pump men, pit men, dump men, asphalt men, joint setter, signalman, pipe men, riprap, dry stone layers, jack hammer, bush hammer, pavement breaker, men on mulching & seeding machines, all seeding & sod laying, landscape work, walk behind self-propelled power saws, grinder, walk behind rollers and tampers of all types, burner men, filling and wiring of baskets for gabion walls, chain saw operator, railroad track laborers, power buggy, power brush cutter, retention liners, walk behind surface planer, chipping hammer, manhole, catch basin or inlet installing, mortar mixer, laser men. *Micro paving and crack sealing.

CLASS 3: Asbestos, toxic, bioremediation and Phyto-remediation, lead or hazardous materials abatement when certification or license is required, Drilling Equipment Only Where a Separate Air Compressor Unit Supplies Power.

CLASS 4: Asphalt screed man, blaster, all laborers involved in pipejacking and boring operations not exceeding more than 10 feet into pipe, boring or drilled area.

| WAGES: (per hour) | 07/01/2024 |
|-------------------|------------|
| Class 1 | \$ 45.75 |
| Class 2 | 49.45 |
| Class 3 | 53.85 |
| Class 4 | 58.90 |

* When laborers are performing micro paving, crack sealing or slurry application when not part of asphalt prep operations laborers shall receive an additional \$2.50 per hour over rate.

** To be allocated at a later date.

SHIFT WORK

SHIFT DIFFERENTIAL: Night work and irregular shift require 20% increase on wages for all Government mandated night and irregular shift work.

SUPPLEMENTAL BENEFITS

Per hour:

| Journeyman | \$ 30.23 |
|--------------------|----------|
| Shift Differential | 35.72 |

OVERTIME PAY

See (B, E, P, *R, **S, ***T, X) on OVERTIME PAGE *For Mon-Fri Holidays, Double Benefits to be paid for all hours worked. **For Saturday Holidays, Two- and one-half Benefits for all hours worked. ***For Sunday Holidays, Triple Benefits for all hours worked.

HOLIDAY

| Paid: | See (5, 6, 15, 25) on HOLIDAY PAGE |
|-----------|------------------------------------|
| Overtime: | See (5, 6, 15, 25) on HOLIDAY PAGE |
| | |

To be eligible for a paid holiday, an employee must work at least two (2) days in the calendar week or payroll week in which the holiday falls.

REGISTERED APPRENTICES

(1000) hour terms at the following wages.

| | 07/01/2024 |
|--|-------------------|
| 1st term | \$ 28.05 |
| 2nd term | 32.35 |
| 3rd term | 36.70 |
| 4th term | 41.00 |
| Supplemental Benefits per hour: All Terms Regular All Terms Shift Rate | \$ 29.40 34.79 |

Laborer - Tunnel

JOB DESCRIPTION Laborer - Tunnel

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES

Chenango: Townships of Columbus, Sherburne and New Berlin. Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

WAGES

Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

Class 5: Site work related to Shaft/Tunnel

WAGES: (per hour)

| | 07/01/2024 | 06/01/2025 |
|---------|------------|------------|
| Class 1 | \$ 57.05 | \$ 58.55 |
| Class 2 | 59.20 | 60.70 |
| Class 4 | 65.60 | 67.10 |
| Class 5 | 49.90 | 51.40 |

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional \$ 3.00 an hour.

SHIFT WORK

SHIFT DIFFERENTIAL...On all Government mandated irregular shift work:

- Employee shall be paid at time and one half the regular rate Monday through Friday.
- Saturday shall be paid at 1.65 times the regular rate.
- Sunday shall be paid at 2.15 times the regular rate.

SUPPLEMENTAL BENEFITS

Per hour:

| Benefit 1 | \$ 36.98 | \$ 38.23 |
|-----------|----------|----------|
| Benefit 2 | 55.39 | 59.99 |
| Benefit 3 | 74.58 | 76.73 |

Benefit 1 applies to straight time hours, paid holidays not worked.

Benefit 2 applies to over 8 hours in a day (M-F), irregular shift work hours worked, and Saturday hours worked.

11-754H/H

12/01/2024

Benefit 3 applies to Sunday and Holiday hours worked.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE See (5, 6, 15, 16, 25) on HOLIDAY PAGE

When a recognized Holidays falls on Saturday or Sunday, holidays falling on Saturday shall be recognized or observed on Friday and holidays falling on Sunday shall be recognized or observed on Monday. Employees ordered to work on the Saturday or Sunday of the holiday or on the recognized or the observed Friday or Monday for those holidays falling on Saturday or Sunday shall receive double time the established rate and benefits for the holiday.

REGISTERED APPRENTICES

FOR APPRENTICE RATES, refer to the appropriate Laborer Heavy & Highway wage rate contained in the wage schedule for the County and location where the work is to be performed.

11-17/60/235/754Tun

Lineman Electrician 12/01/2024

JOB DESCRIPTION Lineman Electrician

DISTRICT 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe, or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

Crane Operators: Operation of any type of crane on line projects.

Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on line projects. Digging Machine Operator: All other digging equipment and augering on line projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. Includes access matting for line work.

| Per hour: | 07/01/2024 |
|--|---|
| Group A: Lineman, Technician Crane, Crawler Backhoe Welder, Cable Splicer | \$ 58.90 58.90 58.90 |
| Group B: Digging Mach. Operator Tractor Trailer Driver Groundman, Truck Driver Equipment Mechanic Flagman | 53.01 50.07 47.12 47.12 35.34 |

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work." Includes access matting for line work.

| Lineman, Technician Crane, Crawler Backhoe Cable Splicer Cartified Waldar | \$ 58.90 58.90 64.79 |
|--|----------------------------|
| Certified Welder, Pipe Type Cable | 61.85 |
| Group B: | |
| Digging Mach. Operator | 53.01 |
| Tractor Trailer Driver | 50.07 |
| Groundman, Truck Driver | 47.12 |
| Equipment Mechanic | 47.12 |
| Flagman | 35.34 |

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. Includes access matting for line work.

| Group A: | |
|-------------------------|----------|
| Lineman, Tech, Welder | \$ 60.22 |
| Crane, Crawler Backhoe | 60.22 |
| Cable Splicer | 66.24 |
| Certified Welder, | |
| Pipe Type Cable | 63.23 |
| | |
| Group B: | |
| Digging Mach. Operator | 54.20 |
| Tractor Trailer Driver | 51.19 |
| Groundman, Truck Driver | 48.18 |
| Equipment Mechanic | 48.18 |
| Flagman | 36.13 |
| | |

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. Includes access matting for line work.

| Group A: | |
|-------------------------|----------|
| Lineman, Tech, Welder | \$ 61.41 |
| Crane, Crawler Backhoe | 61.41 |
| Group B: | |
| Digging Mach. Operator | 55.27 |
| Tractor Trailer Driver | 52.20 |
| Groundman, Truck Driver | 49.13 |
| Equipment Mechanic | 49.13 |
| Flagman | 36.85 |

Additional \$1.00 per hour for entire crew when a helicopter is used.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

| 1ST SHIFT | 8:00 AM to 4:30 PM REGULAR RATE |
|-----------|--|
| 2ND SHIFT | 4:30 PM to 1:00 AM REGULAR RATE PLUS 17.3 % |
| 3RD SHIFT | 12:30 AM to 9:00 AM REGULAR RATE PLUS 31.4 % |

SUPPLEMENTAL BENEFITS

| | 07/01/2024 |
|---------|--|
| Group A | \$ 30.90 *plus 7% of the hourly wage paid |
| Group B | \$ 26.90 *plus 7% of |

the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction. WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

PaidSee (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.OvertimeSee (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th |
|-----|-----|-----|-----|-----|-----|-----|
| 60% | 65% | 70% | 75% | 80% | 85% | 90% |

SUPPLEMENTAL BENEFITS per hour:

\$ 26.90 *plus 7% of the hourly wage paid

07/01/2024

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249a

12/01/2024

Lineman Electrician - Teledata

JOB DESCRIPTION Lineman Electrician - Teledata

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

01/01/2025

WAGES

Per hour:

For outside work, stopping at first point of attachment (demarcation).

| | 01/01/2024 | 01/01/2020 |
|------------------------|------------|------------|
| Cable Splicer | \$ 39.24 | \$ 40.81 |
| Installer, Repairman | \$ 37.24 | \$ 38.73 |
| Teledata Lineman | \$ 37.24 | \$ 38.73 |
| Tech., Equip. Operator | \$ 37.24 | \$ 38.73 |
| Groundman | \$ 19.74 | \$ 20.53 |

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

SHIFT WORK

THE FOLLOWING RATES APPLY WHEN THE CONTRACTING AGENCY MANDATES MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION ARE WORKED. WHEN TWO (2) OR THREE (3) SHIFTS ARE WORKED THE FOLLOWING RATES APPLY:

| 1ST SHIFT 2ND SHIFT 3RD SHIFT | REGULAR RATE REGULAR RATE PLUS 10% REGULAR RATE PLUS 15% | |
|-------------------------------------|--|------------------------|
| SUPPLEMENTAL BENEFITS Per hour: | 07/01/2024 | 01/01/2025 |
| Journeyworker | \$ 5.70 *plus 3% of | \$ 5.70 *plus 3% of |

6-1249LT - Teledata

12/01/2024

| the hour | the hour |
|-----------|-----------|
| wage paid | wage paid |

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE Overtime: See (5, 6, 16) on HOLIDAY PAGE

Lineman Electrician - Traffic Signal, Lighting

Columbia, Dutchess, Orange, Putnam, Rockland, Ulster

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting

DISTRICT 6

WAGES

ENTIRE COUNTIES

Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

Crane Operators: Operation of any type of crane on Traffic Signal/Lighting projects. Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on Traffic Signal/Lighting projects. Digging Machine Operator: All other digging equipment and augering on Traffic Signal/Lighting projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

| Per hour: | 07/01/2024 |
|---|---|
| Group A: Lineman, Technician Crane, Crawler Backhoe Certified Welder | \$ 51.82 51.82 54.41 |
| Group B: Digging Machine Tractor Trailer Driver Groundman, Truck Driver Equipment Mechanic Flagman | 46.64 44.05 41.46 41.46 31.09 |

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

| 1ST SHIFT | 8:00 AM TO 4:30 PM REGULAR RATE |
|-----------|---|
| 2ND SHIFT | 4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3% |
| 3RD SHIFT | 12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4% |

SUPPLEMENTAL BENEFITS

Per hour worked:

07/01/2024

| Group A: | \$ 30.90 *plus 7% of the hourly wage paid |
|----------|--|
| Group B | \$ 26.90 *plus 7% of the hourly wage paid |

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction.

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day. Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

| 1st 60% | 2nd 65% | 3rd 70% | 4th 75% | 5th 80% | 6th 85% | 7th 90% |
|------------|------------|--------------|---------------------------------------|------------|------------|------------|
| SUPPLEME | NTAL BENEF | TS per hour: | 07/01/2024 | | | |
| | | | \$ 26.90 *plus 7% of the hourly | | | |

wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aReg8LT

DISTRICT 6

12/01/2024

Lineman Electrician - Tree Trimmer

JOB DESCRIPTION Lineman Electrician - Tree Trimmer

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also includes stump removal near underground energized electrical lines including telephone and CATV lines.

| Per hour: | 07/01/2024 |
|--|--|
| Tree Trimmer Equipment Operator Equipment Mechanic Truck Driver Groundman Flag person | \$ 31.44 27.80 27.80 23.15 19.07 15.00* |
| | |

*NOTE-Rate effective on 01/01/2025 - \$15.50 due to minimum wage increase.

SUPPLEMENTAL BENEFITS

Per hour:

07/01/2024

6-1249TT

| Journeyworker | \$ 10.48 |
|--|---------------|
| , and the second se | *plus 4.5% of |
| | the hourly |
| | wage paid |
| | |

* The 4.5% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

| Paid: | See (5, 6, 8, 15) on HOLIDAY PAGE |
|----------------------------|--|
| Overtime: | See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE |
| NOTE: All paid holidays fa | ling on a Saturday shall be observed on the preceding Friday. All paid holidays falling on a Sunday shall be |

observed on the following Monday.

| Mason - Building | | | | 12/01/2024 |
|--|---------------------------------------|--------------------------|------------|------------|
| JOB DESCRIPTION Mason - Building | | | DISTRICT 9 | |
| ENTIRE COUNTIES Nassau, Rockland, Suffolk, Westchester | | | | |
| WAGES | | | | |
| Per hour: | 07/01/2024 | 12/02/2024 | | |
| Tile Finisher | \$ 49.08 | \$ 49.21 | | |
| To be allocated at a later date. | | | | |
| SUPPLEMENTAL BENEFITS Per Hour: | | | | |
| | \$ 24.56* + 8.32 | \$ 25.01* + 8.33 | | |
| This portion of benefits is subjected to sa | | | | |
| | OLIDAY PAGE , 15, 16, 25) on HOLID | DAY PAGE | | |
| | | | | 9-7/88A-t |
| Mason - Building | | | | 12/01/2024 |
| JOB DESCRIPTION Mason - Building | | | DISTRICT 9 | |
| ENTIRE COUNTIES Nassau, Rockland, Suffolk, Westchester | | | | |
| WAGES | | | | |
| Per hour: | 07/01/2024 | 12/02/2024 Additional | | |
| | | | | |
| | \$ 63.91 | \$ 0.71* | | |
| Tile Setters | \$ 63.91 | \$ 0.71* | | |
| Tile Setters To be allocated at a later date. SUPPLEMENTAL BENEFITS | \$ 63.91 | \$ 0.71* | | |
| Tile Setters To be allocated at a later date. SUPPLEMENTAL BENEFITS | \$ 63.91 \$ 27.66* + \$8.50 | \$ 0.71* | | |
| Tile Setters *To be allocated at a later date. SUPPLEMENTAL BENEFITS Per Hour: * This portion of benefits subject to same j | \$ 27.66* + \$8.50 | | | |

HOLIDAY Paid:

See (1) on HOLIDAY PAGE

See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage per hour:

Overtime:

(750 hour) term at the following wage rate:

| Term: | | | | | | | | | | |
|-----------------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|--|
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | |
| 1- | 751- | 1501- | 2251- | 3001- | 3751- | 4501- | 5251- | 6001- | 6501- | |
| 750 | 1500 | 2250 | 3000 | 3750 | 4500 | 5250 | 6000 | 6750 | 7000 | |
| 07/01/2024 \$22.19 | \$27.21 | \$34.45 | \$39.46 | \$43.07 | \$46.58 | \$50.23 | \$55.24 | \$57.71 | \$62.00 | |
| Supplementa | al Benefits per | hour: | | | | | | | | |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | |
| 07/01/2024 | | | | | | | | | | |
| \$12.55* | \$12.55* | \$15.36* | \$15.36* | \$16.36* | \$17.86* | \$18.86* | \$18.86* | \$18.86* | \$24.11* | |
| +\$.76 | +\$.81 | +\$.91 | +\$.96 | +\$1.43 | +\$1.48 | +\$1.91 | +\$1.97 | +\$4.57 | +\$5.18 | |
| | | | | | | | | | | |

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52A

12/01/2024

JOB DESCRIPTION Mason - Building

ENTIRE COUNTIES

Mason - Building

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

| Per hour: | |
|-----------------------|------------|
| | 07/01/2024 |
| Bricklayer | \$ 47.44 |
| Cement Mason | 47.44 |
| Plasterer/Stone Mason | 47.44 |
| Pointer/Caulker | 47.44 |

Additional \$1.00 per hour for power saw work Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK

SHIFT WORK: When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:

Irregular workday requires 15% premium Second shift an additional 15% of wage plus benefits to be paid Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$38.50

OVERTIME PAY

OVERTIME:Cement MasonSee (B, E, Q, W) on OVERTIME PAGE.All OthersSee (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid: Overtime: See (1) on HOLIDAY PAGE See (5, 6, 16, 25) on HOLIDAY PAGE

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES

Wages per hour:

| 0 | /age Rates for 0 ed on Dec 01 20 | | 80/2025 | | | Publis | | State Department of Labor 4015694 Rockland County |
|--------------------------------------|-------------------------------------|------------------|-------------------------------|--|---------------|------------------------|------------------------|--|
| 750 hour te | rms at the follo | wing percenta | ge of Journey | man's wage | | | | |
| 1st 50% | 2nd 55% | 3rd 60% | 4th 65% | 5th 70% | 6th 75% | 7th 80% | 8th 85% | |
| Supplemen | tal Benefits pe | r hour | | | | | | |
| | rms at the follo | • • | | | | | | |
| 1st 50% | 2nd 55% | 3rd 60% | 4th 65% | 5th 70% | 6th 75% | 7th 80% | 8th 85% | |
| Apprentices | s indentured be | efore June 1st, | 2011 receive | full journeyma | n benefits | | | 11-5wp-b |
| Mason - E | Building | | | | | | | 12/01/2024 |
| | CRIPTION M | ason - Building | | | | | DISTRICT 9 | |
| ENTIRE C | OUNTIES | | | | | | | |
| Bronx, Duto | chess, Kings, N | lassau, New Y | ork, Orange, F | utnam, Quee | ns, Richmond | , Rockland, Su | ffolk, Sullivan, Ulste | er, Westchester |
| Per Hour: | | | | 07/01/2024 | 4 | 01/06/202 | 5 | |
| Marble Cutt | ters & Setters | | | \$ 63.92 | | Additional \$ 0.75* | | |
| | | data | | ψ 00.52 | | ψ 0.70 | | |
| | cated at a later IENTAL BEN | | | | | | | |
| Journeywor | ker | | | \$ 40.05 | | | | |
| OVERTIM See (B, E, C | E PAY Q, V) on OVER | TIME PAGE | | | | | | |
| HOLIDAY Paid: Overtime: | | See (1) on H | IOLIDAY PAG 11, 15, 16, 25 | | | | | |
| | | | 11, 10, 10, 20 | ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, | - TROL | | | |
| | rms at the follo 2nd | wing wage 3rd | 4th | 5th | 6th | 7th | 8th | |
| 0- 3000 | 3001- 3750 | 3751- 4500 | 4501- 5250 | 5251- 6000 | 6001- 6750 | 6751- 7500 | 7500+ | |
| \$ 27.01 | \$ 40.52 | \$ 43.88 | \$ 47.26 | \$ 50.64 | \$ 54.32 | \$ 60.71 | \$ 63.92 | |
| Supplemen 07/01/202 | tal Benefits per 4 | r hour: | | | | | | |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | |
| \$ 26.42 | \$ 29.76 | \$ 30.61 | \$ 31.44 | \$ 32.28 | \$ 37.55 | \$ 39.23 | \$ 40.05 | |
| | | | | | | | | 9-7/4 |
| | | | | | | | | 40/04/0004 |

Mason - Heavy&Highway

JOB DESCRIPTION Mason - Heavy&Highway

ENTIRE COUNTIES Putnam, Rockland, Westchester

PARTIAL COUNTIES Orange: Only the Township of Tuxedo.

WAGES

Per hour:

07/01/2024

DISTRICT 11

12/01/2024

| | . |
|--------------------|----------|
| Bricklayer | \$ 47.94 |
| Cement Mason | 47.94 |
| Marble/Stone Mason | 47.94 |
| Plasterer | 47.94 |
| Pointer/Caulker | 47.94 |

Additional \$1.00 per hour for power saw work

Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK

When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular workday requires 15% premium Second shift an additional 15% of wage plus benefits to be paid Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

| Journeyman | \$ 38.50 |
|--------------|----------|
| OVERTIME PAY | |

| Cement Mason | See (B, E, Q, W) |
|--------------|--------------------|
| All Others | See (B, E, Q,) |

HOLIDAY

Paid: Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE See (5, 6, 16, 25) on HOLIDAY PAGE

- Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

- Supplemental Benefits are not paid for paid Holiday

- If Holiday is worked, Supplemental Benefits are paid for hours worked.

- Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 50% | 55% | 60% | 65% | 70% | 75% | 80% | 85% |

Supplemental Benefits per hour

| 750 hour terms at the following percentage of journeyman supplements | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th |
| 50% | 55% | 60% | 65% | 70% | 75% | 80% | 85% |

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

Operating Engineer - Building / Heavy&Highway 12/01/2024

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway

ENTIRE COUNTIES

Delaware, Orange, Rockland, Sullivan, Ulster

WAGES

CLASS A5: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 140ft boom and over.

CLASS A4: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 100ft to 139ft boom.

CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes with a boom under 100ft.

CLASS A2: Cranes, Derricks and Pile Drivers less than 100 tons with 140ft boom and over.

CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 100ft to 139ft boom.

DISTRICT 11

11-5WP-H/H

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with a boom under 100ft.; Autograde Combination Subgrader, Base Material Spreader and Base Trimmer (CMI and Similar Types); Autograde Pavement profiler (CMI and Similar Types); Autograde Pavement Profiler and Recycle type (CMI and Similar Type); Autograde Placer-Trimmer-Spreader Comb. (CMI & Similar types); Autograde Slipform Paver (CMI & Similar Types); Central Power Plants (all types); Chief of Party; Concrete Paving Machines; Drill (Bauer, AMI and Similar Types); Drillmaster, Quarrymaster (Down the Hole Drill), Rotary Drill, Self-Propelled Hydraulic Drill, Self-Powered Drill; Draglines; Elevator Graders; Excavator; Front End Loaders (5 yds. and over); Gradall's; Grader-Rago; Helicopters (Co-Pilot); Helicopters (Communications Engineer);Juntann Pile Driver; Locomotive (Large); Mucking Machines; Pavement & Concrete Breaker, i.e., Superhammer & Hoe Ram; Roadway Surface Grinder; Prentice Truck; Scooper (Loader and Shovel); Shovels; Tree Chopper with Boom; Trench Machines (Cable Plow); Tunnel Boring Machine; Vacuum Truck

CLASS B: "A" Frame; Backhoe (Combination); Boom Attachment on Loaders (Rate based on size of Bucket) not applicable to Pipehook; Boring and Drilling Machines; Brush Chopper, Shredder and Tree Shredder, Tree Shearer; Bulldozer(Fine Grade); Cableways; Carryalls; Concrete Pump; Concrete Pumping System, Pump Concrete and Similar Types; Conveyors (125 ft. and over); Drill Doctor (duties incl. Dust Collector Maintenance); Front End Loaders (2 yds. but less than 5 yds.); Graders (Finish); Groove Cutting Machine (Ride on Type); Heater Planer; Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Long Boom Rate to be applied if Hoist is "Outside Material Tower Hoist"**; Hydraulic Cranes-10 tons and under; Hydraulic Dredge; Hydro-Axe; Hydro Blaster; Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Log Skidder; Pans; Pavers (all) concrete; Plate and Frame Filter Press; Pumpcrete Machines, Squeezecrete & Concrete Pumping (regardless of size); Scrapers; Side Booms; "Straddle"Carrier-Ross and similar types; Winch Trucks (Hoisting); Whip Hammer

CLASS C: Asphalt Curbing Machine; Asphalt Plant Engineer; Asphalt Spreader; Autograde Tube Finisher and Texturing Machine (CMI & Similar types); Autograde Curecrete Machine (CMI & Similar Types); Autograde Curb Trimmer & Sidewalk, Shoulder, Slipform (CMI & Similar Types); Bar Bending Machines (Power); Barrier Moving Machine-Zipper; Batchers, Batching Plant and Crusher on Site; Belt Conveyor Systems; Boom Type Skimmer Machines; Bridge Deck Finisher; Bulldozer(except fine grade); Car Dumpers (Railroad); Compressor and Blower Type Units (used independently or mounted on dual purpose Trucks, on Job Site or in conjunction with jobsite, in Loading and Unloading of Concrete, Cement, Fly Ash, Instantcrete, or Similar Type Materials); Compressors (2 or 3 in Battery); Concrete Finishing Machines; Concrete cleaning decontamination machine operator; Concrete Saws and Cutters (Ride-on type); Concrete Spreaders (Hetzel, Rexomatic and Similar Types); Concrete Vibrators; Conveyors (under 125 feet); Crushing Machines; Directional Boring Machines; Ditching Machine-small (Ditch-witch, Vermeer, or Similar type); Dope Pots (Mechanical with or without pump); Dumpsters; Elevator; Fireman; Fork Lifts (Economobile, Lull and Similar Types of Equipment); Front End Loaders (1 yd. and over but under 2 yds.); Generators (2 or 3 in Battery); Giraffe Grinders; Grout Pump; Gunnite Machines (excluding nozzle); Hammer Vibrator (in conjunction with Generator); Heavy Equipment Robotics Operator Technician; Hoists-Roof, Tugger, Aerial Platform Hoist & House Cars; Hoppers; Hopper Doors (power operated); Hydro Blaster; Hydraulic Jacking Trailer; Ladders (motorized); Laddervator; Locomotive-dinky type; Maintenance -Utility Man; Master Environmental Maintenance Technician; Mechanics; Mixers (Excepting Paving Mixers); Motor Patrols; Pavement Breakers (small self - propelled ride on type-also maintains compressor hydraulic unit); Pavement Breaker-truck mounted; Pipe Bending Machine (Power); Pitch Pump; Plaster Pump (regardless of size); Post Hole Digger (Post Pounder & Auger); Pot Hole Killer Trucks or equivalent; Rod Bending Machines (Power); Roller-Black Top; Scales (Power); Seaman pulverizing mixer; Shoulder widener; Silos; Skidsteer (all attachments); Skimmer Machines (boom-type); Steel Cutting Machine (service & maintain); Tam Rock Drill; Tractors; Transfer Machine; Captain (Power Boats); Tug Master (powerboats); Ultra High Pressure Waterjet Cutting Tool System operator/maintenance technician; Vacuum Blasting Machine; Vibrating Plants (used in conjunction with unloading); Welder and Repair Mechanics

CLASS D: Brooms and Sweepers; Chippers; Compressor (single); Concrete Spreaders (small type); Conveyor Loaders (not including Elevator Graders); Engines-large diesel (1620 HP) and Staging Pump; Farm Tractors; Fertilizing Equipment (Operation & Maintenance of); Fine Grade Machine (small type); Form Line Graders (small type); Front End Loader (under 1 yard); Generator (single); Grease, Gas, Fuel and Oil supply trucks; Heaters (Nelson or other type incl. Propane, Natural Gas or Flow type Units); Lights, Portable Generating Light Plants; Mixers (Concrete, small); Mulching Equipment (Operation and Maintenance of); Pumps (2 or less than 4 inch suction); Pumps (4 inch suction and over incl. submersible pumps); Pumps (Diesel Engine and Hydraulic-immaterial of power); Road Finishing Machines (small type); Rollers-grade, fill or stone base; Seeding Equip. (Operation and Maintenance of); Sprinkler & Water Pump Trucks (used on jobsite or in conjunction with jobsite); Steam Jennies and Boilers-irrespective of use; Stone Spreader; Tamping Machines, Vibrating Ride-on; Temporary Heating Plant (Nelson or other type, incl. Propane, Natural Gas or Flow Type Units); Water & Sprinkler Trucks (used on or in conjunction with jobsite); Welding Machines (Gas, Diesel, and/or Electric Converters of any type, single, two, or three in a battery); Wellpoint Systems (including installation by Bull Gang and Maintenance of)

CLASS E: Assistant Engineer/Oiler; Drillers Helper; Maintenance Apprentice (Deck Hand); Maintenance Apprentice (Oiler); Mechanics' Helper; Tire Repair and Maintenance; Transit/Instrument Man

| WAGES:(per hour) | | |
|------------------|---------------------|------------|
| | 07/01/2024 | 07/01/2025 |
| | | Additional |
| Class A5 | \$ 66.97 plus 5.00* | \$ 2.50*** |
| Class A4 | 65.97 plus 5.00* | 2.50*** |
| Class A3 | 64.97 plus 5.00* | 2.50*** |
| Class A2 | 62.47 plus 5.00* | 2.50*** |
| Class A1 | 61.47 plus 5.00* | 2.50*** |
| Class A | 60.47 plus 5.00* | 2.50*** |
| Class B | 58.88 plus 5.00* | 2.50*** |

| Class C | 56.97 plus 5.00* | 2.50*** | |
|-------------------------------------|------------------|---------|--|
| Class D | 55.34 plus 5.00* | 2.50*** | |
| Class E | 51.63 plus 5.00* | 2.50*** | |
| Safety Engineer | 61.21 plus 5.00* | 2.50*** | |
| Helicopter: | | | |
| Pilot/Engineer | 62.29 plus 5.00* | 2.50*** | |
| Co Pilot | 60.47 plus 5.00* | 2.50*** | |
| Communications Engineer | 60.47 plus 5.00* | 2.50*** | |
| Surveying: | | | |
| Chief of Party | 60.47 plus 5.00* | 2.50*** | |
| Transit/Instrument Man | 51.63 plus 5.00* | 2.50*** | |
| Rod/Chainman | 51.05 plus 5.00* | 2.50*** | |
| Additional \$0.75 for Survey work 1 | • | | |
| Additional \$0.50 for Hydrographic | work. | | |
| | | | |

*The \$5.00 is added to the Class Base Wage for all hours worked. Additionally, the \$5.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

**Outside Material Hoist (Class B) receives additional \$ 1.00 per hour on 110 feet up to 199 feet total height, \$ 2.00 per hour on 200 feet and over total height.

***To be allocated at a later date

- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SHIFT WORK

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$34.00*

*15% premium is also required on shift work benefits

OVERTIME PAY

See (B, E, Q, *V, X) on OVERTIME PAGE *15% premium is also required on shift work benefits

HOLIDAY

Paid:See (5, 6, 10, 13, 15) on HOLIDAY PAGEOvertime:See (5, 6, 10, 13, 15) on HOLIDAY PAGEHolidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES

(1) year terms at the following percentage of journeyman's wage:

| 1st year | 60% of Class base wage plus \$5.00* |
|----------|-------------------------------------|
| 2nd year | 70% of Class base wage plus \$5.00* |
| 3rd year | 80% of Class base wage plus \$5.00* |
| 4th year | 90% of Class base wage plus \$5.00* |

\$34.00

*The \$5.00 is added to the Class Base Wage for all hours worked. Additionally, the \$5.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

Supplemental Benefits per hour:

Apprentices

DISTRICT 4

11-825

12/01/2024

Operating Engineer - Marine Dredging

JOB DESCRIPTION Operating Engineer - Marine Dredging

ENTIRE COUNTIES

Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES

These wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for all equipment and operators are only for marine dredging work in navigable waters found in the counties listed above.

| Per Hour: | 07/01/2024 | | | |
|---|--|--|--|--|
| CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator 1000HP or mor | \$ 45.26 re. | | | |
| CLASS A2 Crane Operator (360 swing) | 40.33 | | | |
| CLASS B Dozer, Front Loader Operator on Land | To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits. | | | |
| CLASS B1 Derrick Operator (180 swing) Spider/Spill Barge Operator Operator II, Fill Placer, Engineer Chief Mate, Electrician,Chief Welder, Maintenance Engineer,Licensed Boat, | 39.14 Crew Boat Operator | | | |
| CLASS B2 Certified Welder | 36.84 | | | |
| CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer | 35.83 | | | |
| CLASS C2 Boat Operator | 34.68 | | | |
| CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor | 28.81 | | | |
| SUPPLEMENTAL BENEFITS Per Hour: THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES | | | | |
| All Classes A & B | \$ 12.00 plus 7% of straight time wage, Overtime hours add \$ 0.63 | | | |
| All Class C & D | \$ 11.75 plus 7% of straight time wage, Overtime hours add \$ 0.50 | | | |
| OVERTIME PAY See (B2, F, R) on OVERTIME PAGE | | | | |
| HOLIDAY Paid: See (1) on | HOLIDAY PAGE | | | |

DISTRICT 11

Overtime:

See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

12/01/2024

Operating Engineer - Steel Erectors

JOB DESCRIPTION Operating Engineer - Steel Erectors

ENTIRE COUNTIES

Delaware, Orange, Rockland, Sullivan, Ulster

WAGES

CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with a 140 ft. boom and over.

CLASS A2: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with up to a 139 ft. boom and under.

CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 140 ft. boom and over.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with up to a 139 ft. boom and under.

CLASS B: "A" Frame; Cherry Pickers(10 tons and under); Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Side Booms; Straddle Carrier

CLASS C: Aerial Platform used as Hoist; Compressors (2 or 3 in Battery); Concrete cleaning/ decontamination machine operator; Directional Boring Machines; Elevator or House Cars; Conveyers and Tugger Hoists; Fireman; Fork Lifts; Generators (2 or 3 in Battery); Heavy Equipment Robotics Operator/Technician; Master Environmental Maintenance Technician; Maintenance -Utility Man; Rod Bending Machines (Power); Captain(powerboat); Tug Master; Ultra High Pressure Waterjet Cutting Tool System; Vacuum Blasting Machine; Welding Machines(gas or electric, 2 or 3 in battery, including diesels); Transfer Machine; Apprentice Engineer/Oiler with either one compressor or one welding machine when used for decontamination and remediation

CLASS D: Compressor (single); Welding Machines (Gas, Diesel, and/or Electric Converters of any type); Welding System Multiple (Rectifier Transformer type)

07/01/2025

CLASS E: Assistant Engineer/Oiler; Maintenance Apprentice (Deck Hand);Drillers Helper; Maintenance Apprentice (Oiler); Mechanics' Helper; Transit/Instrument Man

WAGES:(per hour)

| | 07/01/2024 | 07/01/2025 |
|--------------------------------------|------------------------------|------------|
| | | Additional |
| Class A3 | \$ 68.99 plus 5.00* | \$ 2.50** |
| Class A2 | 67.33 plus 5.00* | 2.50** |
| Class A1 | 64.49 plus 5.00* | 2.50** |
| Class A | 62.83 plus 5.00* | 2.50** |
| Class B | 60.04 plus 5.00* | 2.50** |
| Class C | 57.38 plus 5.00* | 2.50** |
| Class D | 55.85 plus 5.00* | 2.50** |
| Class E | 52.09 plus 5.00* | 2.50** |
| Vacuum Truck | 60.80 plus 5.00* | 2.50** |
| Safety Engineer | 61.66 plus 5.00* | 2.50** |
| Helicopter: | | |
| Pilot/Engineer | 64.49 plus 5.00* | 2.50** |
| Co Pilot | 64.10 plus 5.00* | 2.50** |
| Communications Engineer | 64.10 plus 5.00* | 2.50** |
| Surveying: | | |
| Chief of Party | 60.80 plus 5.00* | 2.50** |
| Transit/Instrument man | 52.09 plus 5.00* | 2.50** |
| Rod/Chainman | 51.05 plus 5.00* | 2.50** |
| Additional \$0.75 for Survey work Tu | Innels under compressed air. | |
| Additional \$0.50 for Hydrographic w | /ork. | |

07/04/2024

*The \$5.00 is added to the Class Base Wage for all hours worked. Additionally, the \$5.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

**To be allocated at a later date

- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SHIFT WORK

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$34.00*

*15% premium is also required on shift work benefits

OVERTIME PAY

See (B, E, Q, *V, X) on OVERTIME PAGE *15% premium is also required on shift work benefits

HOLIDAY

Paid:See (5, 6, 10, 13, 15) on HOLIDAY PAGEOvertime:See (5, 6, 10, 13, 15) on HOLIDAY PAGEHolidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES

(1) year terms at the following percentage of journeyman's wage.

| 1st year | 60% of Class base wage plus \$5.00* |
|----------|-------------------------------------|
| 2nd year | 70% of Class base wage plus \$5.00* |
| 3rd year | 80% of Class base wage plus \$5.00* |
| 4th year | 90% of Class base wage plus \$5.00* |

*The \$5.00 is added to the Class Base Wage for all hours worked. Additionally, the \$5.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

Supplemental Benefits per hour:

| Apprentices | \$ 34.00 | | | 11-825SE |
|-----------------------------|------------|--------------------------|------------|------------|
| Painter | | | | 12/01/2024 |
| JOB DESCRIPTION Painter | | | DISTRICT 1 | |
| ENTIRE COUNTIES Rockland | | | | |
| WAGES | | | | |
| Wages per hour | 07/01/2024 | 05/01/2025 Additional | | |
| Brush/Paper Hanger | \$ 42.01 | \$ 1.99* | | |
| Dry Wall finisher | 42.01 | 1.99* | | |
| Sandblaster-Painter | 42.01 | 1.99* | | |
| Lead Abatement | 42.01 | 1.99* | | |
| Spray Rate | 43.01 | 1.99* | | |
| | | | | |

(*) To be allocated at later date.

See Bridge Painters rates for the following work:

Structural Steel, all work performed on tanks, ALL BRIDGES, towers, smoke stacks, flag poles. Rate shall apply to all of said areas from the ground up.

SUPPLEMENTAL BENEFITS

Per hour

DISTRICT 8

| Supplemental Benefits | per hour work | ed \$ 11.3 | 9 | | |
|---|------------------------|-----------------------------|---------------|------------|--|
| 1st 2nd 50% 55% | 3rd 65% | 4th 75% | 5th 85% | 6th 95% | |
| Wages per hour Six (6) month terms at | the following p | ercentage of J | lourneypersor | 's wage | |
| | RENTICES | | | | |
| HOLIDAY Paid: Overtime: | See (1) c See (5, 6 | n HOLIDAY P) on HOLIDAY | AGE ′ PAGE | | |
| OVERTIME PAY See (B, E, E2, Q) on O | VERTIME PAG | GE | | | |
| Journeyworker | | \$ 27.3 | 7 | | |

JOB DESCRIPTION Painter - Bridge & Structural Steel

ENTIRE COUNTIES

Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

| Per Hour: STEEL: | |
|---------------------|------------------------|
| Bridge Painting: | 07/01/2024 \$ 56.00 |
| | + 10.35* |

ADDITIONAL \$7.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK

When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS

Per Hour: Journeyworker:

\$ 12.43 + 31.55*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

OVERTIME PAY

See (B, F, R) on OVERTIME PAGE

HOLIDAY Paid: Overtime:

See (1) on HOLIDAY PAGE See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage - Per hour: Apprentices: (1) year terms.

| 1st year | \$ 22.40 + 4.14 |
|-----------------------------------|--------------------|
| 2nd year | \$ 33.60 + 6.21 |
| 3rd year | \$ 44.80 + 8.28 |
| Supplemental Benefits - Per hour: | 10.20 |
| 1st year | \$ 1.16 + 12.62 |
| 2nd year | \$ 7.46 + 18.93 |
| 3rd year | \$ 9.94 + 25.24 |

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

| Painter - Line Striping | | | 12/01/2024 |
|--|------------------------------|-------------------|-------------------|
| JOB DESCRIPTION Painter - Line Stripi | ng | DISTR | RICT 8 |
| ENTIRE COUNTIES Albany, Clinton, Columbia, Dutchess, Essex Rockland, Saratoga, Schenectady, Schoha | | | |
| WAGES Per hour: | | | |
| Painter (Striping-Highway): | 07/01/2024 | 04/01/2025 | 04/01/2026 |
| Striping-Machine Operator* | \$ 34.12 | \$ 35.49 | \$ 36.93 |
| Linerman Thermoplastic | 41.12 | 42.74 | 44.44 |
| Note: * Includes but is not limited to: Positio equipment used in the maintenance and pro SHIFT WORK When directly specified in public agency or | otection of traffic safety. | - | |
| performed after 9:00pm and before 5:00am | | | |
| SUPPLEMENTAL BENEFITS Per hour paid: | | | |
| Journeyworker: Striping Machine Operator: Linerman Thermoplastic: | \$23.65 23.65 | \$ 24.30 24.30 | \$ 24.95 24.95 |
| OVERTIME PAY See (B, B2, E2, F, S) on OVERTIME PAGE | E | | |
| | HOLIDAY PAGE HOLIDAY PAGE | | |
| REGISTERED APPRENTICES One (1) year terms at the following wage ra | tes | | |

One (1) year terms at the following wage rates:

| 1st Term: | \$ 16.00 | \$ 16.00 | \$ 16.00 |
|-----------|----------|----------|----------|
| 2nd Term: | 20.47 | 21.29 | 22.16 |
| 3rd Term: | 27.30 | 28.39 | 29.54 |

Supplemental Benefits per hour:

| All terms: | \$ 23.65 | \$ 24.30 | \$ 24.95 8-1456-LS |
|--------------------------|----------|----------|-----------------------|
| Painter - Metal Polisher | | | 12/01/2024 |

JOB DESCRIPTION Painter - Metal Polisher

DISTRICT 8

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

| WA | GES |
|----|-----|
|----|-----|

| | 07/01/2024 |
|------------------|------------|
| Metal Polisher | \$ 39.33 |
| Metal Polisher* | 40.43 |
| Metal Polisher** | 43.33 |

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

| SUPPLEMENTAL BENEFITS Per Hour: | 07/01/2024 |
|--------------------------------------|------------|
| Journeyworker: All classification | \$ 12.79 |
| | |

OVERTIME PAY See (B, E, P, T) on OVERTIME PAGE

| HOLIDAY | | |
|-----------|----------------------------|-----------------------|
| | | , 26) on HOLIDAY PAGE |
| Overtime: | See (5, 6, 11, 15, 16, 25, | , 26) on HOLIDAY PAGE |

REGISTERED APPRENTICES

Wages per hour:

One (1) year term at the following wage rates:

| | 07/01/2024 |
|------------|------------|
| 1st year | \$ 19.67 |
| 2nd year | 21.63 |
| 3rd year | 23.60 |
| 1st year* | \$ 22.06 |
| 2nd year* | 22.07 |
| 3rd year* | 24.14 |
| 1st year** | \$ 22.17 |
| 2nd year** | 24.13 |
| 3rd year** | 26.10 |

*Note: Applies on New Construction & complete renovation ** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits: Per hour:

| 1st year | \$ 8.69 |
|----------|---------|
| 2nd year | 8.69 |
| 3rd year | 8.69 |

8-8A/28A-MP

12/01/2024

Plumber

JOB DESCRIPTION Plumber

ENTIRE COUNTIES Orange, Rockland, Sullivan

DISTRICT 11

PARTIAL COUNTIES

Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES

REFRIGERATION: For commercial and industrial refrigeration which means service, maintenance, and installation work where the combined compressor tonnage does not exceed 40 tons.

AIR CONDITIONING: Air conditioning to be installed that is water cooled shall not exceed 25 tons. This will include the piping of the component system and erection of water tower. Air conditioning that is air cooled shall not exceed 50 tons.

| WAGES: (per hour) | | |
|---------------------------------------|------------|------------|
| · · · · · · · · · · · · · · · · · · · | 07/01/2024 | 05/01/2025 |
| | | Additional |
| Plumber | \$ 40.09 | \$ 2.50* |

*To be allocated at a later date

Star Certification: an additional \$ 1.00 per hour over scale will be paid to all those who have Star Certification.

SHIFT WORK

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular workday or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS

Per hour: Journeyman

\$ 36.78*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

See (B, G, P, *V) on OVERTIME PAGE

* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

| HOLIDAY | |
|-----------|--|
| Paid: | See (5, 6, 13, 15, 25) on HOLIDAY PAGE |
| Overtime: | See (5, 6, 13, 15, 25) on HOLIDAY PAGE |

REGISTERED APPRENTICES

(1)year terms at the following wage. 07/01/2024

| | 07/01/2024 |
|----------|------------|
| 1st term | \$ 18.04 |
| 2nd term | 22.05 |
| 3rd term | 26.06 |
| 4th term | 30.07 |
| 5th term | 34.08 |
| | |

Supplemental Benefits per hour: Apprentices

| \$ 16.62* |
|-----------|
| 20.29* |
| 23.95* |
| 27.63* |
| 31.19* |
| |

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages. 11-373 Refrig

| Plumber | | 12/01/2024 |
|---|---|--|
| | Plumber | DISTRICT 11 |
| ENTIRE COUNTIES Orange, Rockland, Sulliv | van | |
| PARTIAL COUNTIES Ulster: Only the Townsh | ips of Plattekill, Marlboro, Wawarsing, and Shawangu | nk (except for Wallkill and Shawangunk Prisons). |
| WAGES WAGES:(per hour) | 07/01/2024 | |
| Plumber/Steamfitter | \$ 51.20 | |
| Note: For all work 40-60 | feet above ground add \$ 0.25 per hour, over 60 feet a Page 51 | add \$ 0.50 per hour. |

SHIFT WORK

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular workday or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman

\$ 45.57

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

See (B, E, Q, *V) on OVERTIME PAGE

* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY Paid:

See (1) on HOLIDAY PAGE See (5, 6, 15, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE When a holiday falls on a Saturday, the day prior shall be considered and recognized as the holiday. When a holiday falls on a Sunday, the day proceeding shall be considered and recognized as the holiday to be observed.

REGISTERED APPRENTICES

(1) year terms at the following wages.

| (1) your torrite at the following magoe: | |
|---|---|
| | 07/01/2024 |
| 1st term | \$ 17.92 |
| 2nd term | 23.04 |
| 3rd term | 28.16 |
| 4th term | 33.28 |
| 5th term | 40.96 |
| Supplemental Benefits per hour: 1st term 2nd term 3rd term 4th term 5th term | \$ 16.03* 20.58* 25.12* 29.68* 36.48* |

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages. 11-373 SF

| Roofer | | | | | | | | | | | | | | 12 | /01/2024 |
|---|------------------------|----------------------------|----------------------------|----------------------------|------------|---------|-------|--------|--------|----------|--------|-------|-----|----|----------|
| JOB DESCRI | JOB DESCRIPTION Roofer | | | | DISTRICT 9 | | | | | | | | | | |
| ENTIRE COU Bronx, Dutches | | ew York, Orang | ie, Putnam, Qi | ueens, Richn | mond, F | Rockl | land | , Sul | llivar | n, Ulste | r, Wes | tches | ter | | |
| WAGES Per Hour: | | | 07/01/2024 | | | | | | | | | | | | |
| Roofer/Waterp | roofer | | \$ 48.50 + \$7.00* | | | | | | | | | | | | |
| * This portion is | s not subject | ted to overtime | premiums. | | | | | | | | | | | | |
| Note: Abateme | nt/Removal | of Asbestos co | ntaining roofs | and roofing | materia | al is c | class | sified | l as l | Roofer | | | | | |
| SUPPLEMEN Per Hour: | TAL BENE | EFITS | \$ 31.87 | | | | | | | | | | | | |
| OVERTIME P See (B, H) on (Note: An obser | OVERTIME | | Sunday will be | observed the | he follov | wing | Mon | ıday. | | | | | | | |
| HOLIDAY Overtime: | | See (5, 6) on | | | | - | | - | | | | | | | |
| REGISTEREI (1) year term | | | or to 01/01/202 | 3 | | | | | | | | | | | |
| | 1st \$ 16.97 | 2nd \$ 24.25 + 3.50* | 3rd \$ 29.10 + 4.20* | 4th \$ 36.37 + 5.26* | | | | | | | | | | | |
| Supplements: | 1st | 2nd | 3rd | 4th | | | | | | | | | | | |

\$ 19.31

3rd

\$24.25

+ 3.50*

3rd

\$ 16.17

\$24.02

4th

\$29.10

 $+ 4.20^{*}$

4th

\$ 19.31

5th

+ 5.26

5th

\$24.02

\$ 36.37

\$16.17

2nd

\$21.82

+ 3.16*

2nd

\$14.59

9-8R

8-38

12/01/2024

12/01/2024

JOB DESCRIPTION Sheetmetal Worker

\$4.10

1st

1st

\$7.73

\$18.43

* This portion is not subjected to overtime premiums.

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

ENTIRE COUNTIES

Sheetmetal Worker

Supplements:

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester WAGES

| | 07/01/2024 |
|-------------------|------------|
| SheetMetal Worker | \$ 49.51 |
| | + 3.71* |

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

\$46.20

SHIFT WORK

For all NYS D.O.T. and other Governmental mandated off-shift work: 10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS

Journeyworker

OVERTIME PAY

OVERTIME:.. See (B, E, Q,) on OVERTIME PAGE.

HOLIDAY

Apprentices

| Paid: | See (1) on HOLIDAY PAGE |
|-----------|---|
| Overtime: | See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE |

REGISTERED APPRENTICES

| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th |
|----------|----------|----------|----------|----------|----------|----------|----------|
| \$ 20.20 | \$ 20.81 | \$ 23.12 | \$ 25.42 | \$ 27.74 | \$ 30.08 | \$ 32.86 | \$ 35.63 |
| + 1.48* | + 1.67* | + 1.86* | + 2.04* | + 2.23* | + 2.41* | + 2.60* | + 2.78* |

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

\$ 18.07 22.24

24.71

27.21

29.67

32.12

34.12

36.15

Supplemental Benefits per hour:

1st term 2nd term 3rd term 4th term 5th term 6th term 7th term 8th term

Sheetmetal Worker

JOB DESCRIPTION Sheetmetal Worker

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour:

07/01/2024

DISTRICT 4

DISTRICT 8

Sign Erector

| NOTE: Structurally | Supported Ove | rhead Highway | Signs(See | STRUCTURAL | IRON WORKER CLASS) |
|--------------------|---------------|---------------|-----------|------------|--------------------|

\$ 58.00

| | • • • • | | l Highway Sigr | ns(See STRUC | TURAL IRON | I WORKER CL | ASS) | | |
|---|--|--|---|--------------------------------|--------------------|-----------------|-----------------|-----------------|-----------------------------------|
| Per Hour: | ENTAL BEN | EFIIS | 07/01/2024 | ŀ | 08/01/2024 | 1 | | | |
| Sign Erector | | | \$ 57.12 | | \$ 58.31 | | | | |
| OVERTIME See (B, F, S | E PAY) on OVERTIN | /IE PAGE | | | | | | | |
| HOLIDAY Paid: Overtime: REGISTER Per Hour: | | See (5, 6, 1 | 0, 11, 12, 16, 2 0, 11, 12, 16, 2 | 25) on HOLIDA 25) on HOLIDA | AY PAGE AY PAGE | | | | |
| | ms at the follo | wing percenta | ige of Sign Ere | ctors wage rat | e: | | | | |
| 1st 35% | 2nd 40% | 3rd 45% | 4th 50% | 5th 55% | 6th 60% | 7th 65% | 8th 70% | 9th 75% | 10th 80% |
| SUPPLEME Per Hour: | NTAL BENEF | ITS | | | | | | | |
| 07/01/2024 1st \$ 18.27 | 2nd \$ 20.75 | 3rd \$ 25.22 | 4th \$ 25.70 | 5th \$ 34.66 | 6th \$ 37.74 | 7th \$ 41.65 | 8th \$ 44.78 | 9th \$ 47.93 | 10th \$ 51.04 |
| 08/01/2024 \$ 18.65 | \$ 21.16 | \$ 23.69 | \$ 26.22 | \$35.39 | \$ 38.52 | \$ 42.55 | \$ 45.75 | \$ 48.96 | \$ 52.15 4-137-SE |
| Sprinkler I | -144 | | | | | | | | 12/01/2024 |
| oprinkier i | Itter | | | | | | | | 12/01/2024 |
| | RIPTION Sp | orinkler Fitter | | | | | DISTRICT | 1 | 12/01/2024 |
| JOB DESC | RIPTION Sp DUNTIES | | Sullivan, Ulster | , Westchester | | | DISTRICT | 1 | 12/01/2024 |
| JOB DESC | RIPTION Sp DUNTIES | | | , Westchester | | | DISTRICT | 1 | 12/01/2024 |
| JOB DESC ENTIRE CC Dutchess, O WAGES | RIPTION Sp DUNTIES | n, Rockland, S | | , Westchester | | | DISTRICT | 1 | 12/01/2024 |
| JOB DESC ENTIRE CC Dutchess, O WAGES Per hour Sprinkler Fitter | RIPTION Sp DUNTIES | n, Rockland, S 07/01/2024 \$ 53.34 | | , Westchester | | | DISTRICT | 1 | 12/01/2024 |
| JOB DESC ENTIRE CC Dutchess, O WAGES Per hour Sprinkler Fitter SUPPLEMI Per hour Journeywork OVERTIME | RIPTION Sp DUNTIES range, Putnar ENTAL BEN ter EPAY | n, Rockland, S 07/01/2024 \$ 53.34 EFITS \$ 30.77 | | , Westchester | | | DISTRICT | 1 | 12/01/2024 |
| JOB DESC ENTIRE CC Dutchess, O WAGES Per hour Sprinkler Fitter SUPPLEMI Per hour Journeywork OVERTIME See (B, E, Q HOLIDAY Paid: Overtime: Note: When the double time | RIPTION Sp DUNTIES range, Putnar ENTAL BEN er PAY) on OVERTIF | n, Rockland, S 07/01/2024 \$ 53.34 EFITS \$ 30.77 WE PAGE See (1) on F See (5, 6) o s on Sunday, t n a holiday fall | 4 HOLIDAY PAG n HOLIDAY P/ the following M | E AGE onday shall be | | | ll work perforn | ned on either o | day shall be at rmed on either |
| JOB DESC ENTIRE CC Dutchess, O WAGES Per hour Sprinkler Fitter SUPPLEME Per hour Journeywork OVERTIME See (B, E, Q HOLIDAY Paid: Overtime: Note: When the double tii day shall be | RIPTION Sp DUNTIES range, Putnar ENTAL BEN er PAY) on OVERTIN a holiday falls me rate. When at the double ED APPREN | n, Rockland, S 07/01/2024 \$ 53.34 EFITS \$ 30.77 ME PAGE See (1) on H See (5, 6) o s on Sunday, t n a holiday fall time rate. | 4 HOLIDAY PAG n HOLIDAY P/ the following M | E AGE onday shall be | | | ll work perforn | ned on either o | day shall be at |
| JOB DESC ENTIRE CC Dutchess, O WAGES Per hour Sprinkler Fitter SUPPLEME Per hour Journeywork OVERTIME See (B, E, Q HOLIDAY Paid: Overtime: Note: When the double til day shall be REGISTER Wages per h | RIPTION Sp DUNTIES range, Putnar ENTAL BEN er PAY) on OVERTIN a holiday falls me rate. When at the double ED APPREN iour | n, Rockland, S 07/01/2024 \$ 53.34 EFITS \$ 30.77 ME PAGE See (1) on H See (5, 6) o s on Sunday, t n a holiday fall time rate. | 4 HOLIDAY PAG n HOLIDAY P/ the following M Is on Saturday | E AGE onday shall be | | | ll work perforn | ned on either o | day shall be at |

\$ 60.00

Supplemental Benefits per hour

| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
|---------|---------|----------|----------|----------|----------|----------|----------|----------|---------------------|
| \$ 9.18 | \$ 9.18 | \$ 20.90 | \$ 20.90 | \$ 21.15 | \$ 21.15 | \$ 21.15 | \$ 21.15 | \$ 21.15 | \$ 21.15 1-669.2 |

Teamster - Building / Heavy&Highway

JOB DESCRIPTION Teamster - Building / Heavy&Highway

ENTIRE COUNTIES

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

GROUP 1: LeTourneau Tractors, Double Barrel Euclids, Athney Wagons and similar equipment (except when hooked to scrapers), I-Beam and Pole Trailers, Tire Trucks, Tractor and Trailers with 5 axles and over, Articulated Back Dumps and Road Oil Distributors, Articulated Water Trucks and Fuel Trucks/Trailers, positions requiring a HAZMAT CDL endorsement.

GROUP 1A: Drivers on detachable Gooseneck Low Bed Trailers rated over 35 tons.

GROUP 2: All equipment 25 yards and up to and including 30-yard bodies and cable Dump Trailers and Powder and Dynamite Trucks.

GROUP 3: All Equipment up to and including 24-yard bodies, Mixer Trucks, Dump Crete Trucks and similar types of equipment, Fuel Trucks, Batch Trucks and all other Tractor Trailers, Hi-Rail Truck.

GROUP 4: Tri-Axles, Ten Wheelers, Grease Trucks, Tillerman, Pattern Trucks, Attenuator Trucks, Water Trucks, Bus.

GROUP 5: Straight Trucks.

GROUP 6: Pick-up Trucks for hauling materials and parts, and Escort Man over-the-road.

| WAGES: (per hour) | 07/01/2024 |
|-------------------|------------|
| GROUP 1 | \$ 34.58 |
| GROUP 1A | 35.72 |
| GROUP 2 | 34.02 |
| GROUP 3 | 33.80 |
| GROUP 4 | 33.69 |
| GROUP 5 | 33.57 |
| GROUP 6 | 33.57 |

NOTE ADDITIONAL PREMIUMS:

- Employees engaged in hazardous/toxic waste removal, on a State or Federally designated hazardous/toxic waste site, where the employee comes in contact with hazardous/toxic waste material and when personal protective equipment is required for respiratory, skin, or eye protection, the employee shall receive an additional 20% premium above the hourly wage.

SHIFT WORK

- On projects requiring an irregular shift a premium of 10% will be paid on wages. The premium will be paid for off-shift or irregular shift work when mandated by Governmental Agency.

SUPPLEMENTAL BENEFITS

| Per hour: | |
|----------------|----------|
| First 40 hours | \$ 44.59 |
| Over 40 hours | 36.99 |

OVERTIME PAY

See (*B, E, **E2, ***P, X) on OVERTIME PAGE *Holidays worked Monday through Friday receive Double Time (2x) after 8 hours.

**Makeup day limited to the employees who were working on the site that week.

***Sunday Holidays are paid at a rate of double time and one half (2.5x) for all hours worked.

HOLIDAY

Paid: Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE See (*1) on HOLIDAY PAGE

See ("1) on HOLIDAY PA

- Any employee working two (2) days in any calendar week during which a holiday occurs shall receive a days pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday or Sunday.

*See OVERTIME PAY section for when additional premium is applicable on Holiday hours worked.

11-445B/HH

Teamster - Delivery - Building / Heavy&Highway

12/01/2024

DISTRICT 11

JOB DESCRIPTION Teamster - Delivery - Building / Heavy&Highway

ENTIRE COUNTIES

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

Group 1 Tractor Trailer Drivers

12/01/2024

DISTRICT 11

Group 2 Tri- Axle

| Wages: | 07/01/2024 |
|---------|------------|
| Group 1 | \$ 33.70 |
| Group 2 | 29.70 |

Hazardous/Toxic Waste Removal additional 20% when personal protective equipment is required.

SUPPLEMENTAL BENEFITS

| Per hour paid: | |
|----------------|----------|
| First 40 hours | \$ 32.30 |
| Over 40 hours | 0.00 |

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid:

See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE Overtime:

Employee must work either the scheduled day of work before or the scheduled day of work after the holiday in the workweek.

- Any employee working one (1) day in the calendar week during which a holiday occurs shall receive a day's pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday.

- When any of the recognized holidays occur on Sunday and are celebrated any day before or after the holiday Sunday, such days shall be considered as the holiday and paid for as such.

11-445 B/HH Delivery

12/01/2024

Welder

JOB DESCRIPTION Welder

DISTRICT 1

ENTIRE COUNTIES

Albany, Alegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

07/01/2024 Per hour

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

- (AA) Time and one half of the hourly rate after 7 and one half hours per day
- (A) Time and one half of the hourly rate after 7 hours per day
- (B) Time and one half of the hourly rate after 8 hours per day
- (B1) Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday.
 Double the hourly rate for all additional hours
- (B2) Time and one half of the hourly rate after 40 hours per week
- (B3) Time and one half of the hourly rate after 40 straight hours per week
- (C) Double the hourly rate after 7 hours per day
- (C1) Double the hourly rate after 7 and one half hours per day
- (D) Double the hourly rate after 8 hours per day
- (D1) Double the hourly rate after 9 hours per day
- (E) Time and one half of the hourly rate on Saturday
- (E1) Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
- (E2) Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E3) Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
- (E4) Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E5) Double time after 8 hours on Saturdays
- (F) Time and one half of the hourly rate on Saturday and Sunday
- (G) Time and one half of the hourly rate on Saturday and Holidays
- (H) Time and one half of the hourly rate on Saturday, Sunday, and Holidays
- (I) Time and one half of the hourly rate on Sunday
- (J) Time and one half of the hourly rate on Sunday and Holidays
- (K) Time and one half of the hourly rate on Holidays
- (L) Double the hourly rate on Saturday
- (M) Double the hourly rate on Saturday and Sunday
- (N) Double the hourly rate on Saturday and Holidays
- (O) Double the hourly rate on Saturday, Sunday, and Holidays
- (P) Double the hourly rate on Sunday
- (Q) Double the hourly rate on Sunday and Holidays
- (R) Double the hourly rate on Holidays

- (S) Two and one half times the hourly rate for Holidays
- (S1) Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
- (T) Triple the hourly rate for Holidays
- (U) Four times the hourly rate for Holidays
- (V) Including benefits at SAME PREMIUM as shown for overtime
- (W) Time and one half for benefits on all overtime hours.
- (X) Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

- (1) None
- (2) Labor Day
- (3) Memorial Day and Labor Day
- (4) Memorial Day and July 4th
- (5) Memorial Day, July 4th, and Labor Day
- (6) New Year's, Thanksgiving, and Christmas
- (7) Lincoln's Birthday, Washington's Birthday, and Veterans Day
- (8) Good Friday
- (9) Lincoln's Birthday
- (10) Washington's Birthday
- (11) Columbus Day
- (12) Election Day
- (13) Presidential Election Day
- (14) 1/2 Day on Presidential Election Day
- (15) Veterans Day
- (16) Day after Thanksgiving
- (17) July 4th
- (18) 1/2 Day before Christmas
- (19) 1/2 Day before New Years
- (20) Thanksgiving
- (21) New Year's Day
- (22) Christmas
- (23) Day before Christmas
- (24) Day before New Year's
- (25) Presidents' Day
- (26) Martin Luther King, Jr. Day
- (27) Memorial Day
- (28) Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work State Office Building Campus Building 12 - Room 130 Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

| As Required by Articles 8 and 9 of the NYS Labor Law |
|--|
|--|

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

| Submitted By: (Check Only One) Contracting Agency Architect or Engineerin | g Firm Public Work District Office Date: |
|--|---|
| A. Public Work Contract to be let by: (Enter Data Pertaining to | Contracting/Public Agency) |
| 1. Name and complete address (Check if new or change) | 2. NY State Units (see Item 5). 07 City 01 DOT 08 Local School District 02 OGS 09 Special Local District, i.e., 03 Dormitory Authority Fire, Sewer, Water District 04 State University 10 Village Construction Fund 11 Town 05 Mental Hygiene 12 County |
| Telephone Fax | Facilities Corp. 13 Other Non-N.Y. State |
| E-Mail: | 06 OTHER N.Y. STATE UNIT (Describe) |
| 3. SEND REPLY TO (check if new or change) Name and complete address: | 4. SERVICE REQUIRED. Check appropriate box and provide project information. New Schedule of Wages and Supplements. APPROXIMATE BID DATE : Additional Occupation and/or Redetermination |
| Telephone Fax E-Mail: | PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT : |
| B. PROJECT PARTICULARS | |
| 5. Project Title Description of Work | 6. Location of Project: Location on Site Route No/Street Address Village or City Town County |
| 7. Nature of Project - Check One: 1. New Building 2. Addition to Existing Structure 3. Heavy and Highway Construction (New and Repair) 4. New Sewer or Waterline 5. Other New Construction (Explain) 6. Other Reconstruction, Maintenance, Repair or Alteration 7. Demolition 8. Building Service Contract | 8. OCCUPATION FOR PROJECT : Fuel Delivery Construction (Building, Heavy Highway/Sewer/Water) Guards, Watchmen Tunnel Janitors, Porters, Cleaners, Elevator Operators Residential Moving furniture and equipment Elevator maintenance Trash and refuse removal Exterminators, Fumigators Window cleaners Fire Safety Director, NYC Only Other (Describe) |
| 9. Does this project comply with the Wicks Law involving sepa | arate bidding? YES NO |
| 10. Name and Title of Requester | Signature |



LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, <u>or</u> under NYS Workers' Compensation Law Section 141-b, access the database at this link: <u>https://apps.labor.ny.gov/EDList/searchPage.do</u>

For inquiries please call 518-457-5589.

| AGENCY | Fiscal Officer | FEIN | EMPLOYER NAME | EMPLOYER DBA NAME | ADDRESS | DEBARMENT START DATE | DEBARMENT END DATE |
|--------|----------------|-----------|-------------------------------------|---------------------------------|---|-------------------------|-----------------------|
| DOL | DOL | *****5754 | 0369 CONTRACTORS, LLC | | 515 WEST AVE UNIT PH 13NORWALK CT 06850 | 05/12/2021 | 05/12/2026 |
| DOL | DOL | ****5784 | A.J.M. TRUCKING, INC. | | PO BOX 2064 MONROE NY 10950 | 02/12/2024 | 02/12/2029 |
| DOL | DOL | | AKHLAQ OULAKH | | 4307 28TH AVE ASTORIA NY 11103 | 10/11/2024 | 10/11/2029 |
| DOL | NYC | | ALL COUNTY SEWER & DRAIN, INC. | | 7 GREENFIELD DR WARWICK NY 10990 | 03/25/2022 | 03/25/2027 |
| DOL | DOL | ****8387 | AMERICAN PAVING & MASONRY, CORP. | | 8 FOREST AVE GLEN COVE NY 11542 | 05/24/2024 | 05/24/2029 |
| DOL | DOL | ****8654 | AMERICAN PAVING, INC. | | 8 FORREST AVE. GLEN COVE NY 11542 | 05/24/2024 | 05/24/2029 |
| DOL | NYC | | AMJED PARVEZ | | 401 HANOVER AVENUE STATEN ISLAND NY 10304 | 01/11/2021 | 01/11/2026 |
| DOL | DOL | | ANGELO F COKER | | 2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | | ANGELO GARCIA | | 515 WEST AVE UNIT PH 13NORWALK CT 06850 | 05/12/2021 | 05/12/2026 |
| DOL | DOL | | ANGELO STANCO | | 8 FOREST AVE. GLEN COVE NY 11542 | 05/24/2024 | 05/24/2029 |
| DOL | DOL | | ANGELO TONDO | | 449 WEST MOMBSHA ROAD MONROE NY 10950 | 06/06/2022 | 06/06/2027 |
| DOL | DOL | *****4231 | ANKER'S ELECTRIC SERVICE, INC. | | 10 SOUTH 5TH ST LOCUST VALLEY NY 11560 | 09/26/2022 | 09/26/2027 |
| DOL | DOL | | ANTHONY MONGELLI | | PO BOX 2064 MONROE NY 10950 | 02/12/2024 | 02/12/2029 |
| DOL | NYC | | ARADCO CONSTRUCTION CORP | | 115-46 132RD ST SOUTH OZONE PARK NY 11420 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | | ARNOLD A. PAOLINI | | 1250 BROADWAY ST BUFFALO NY 14212 | 02/03/2020 | 02/03/2025 |
| DOL | NYC | | AVM CONSTRUCTION CORP | | 117-72 123RD ST SOUTH OZONE PARK NY 11420 | 09/17/2020 | 09/17/2025 |
| DOL | NYC | | AZIDABEGUM | | 524 MCDONALD AVENUE BROOKLYN NY 11218 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | *****8421 | B & B DRYWALL, INC | | 206 WARREN AVE APT 1WHITE PLAINS NY 10603 | 12/14/2021 | 12/14/2026 |
| DOL | DOL | | B&L RENOVATION CO. | | 618 OCEAN PARKWAY APT A6BROOKLYN NY 11230 | 09/17/2020 | 09/17/2025 |
| DOL | NYC | *****2113 | BHW CONTRACTING, INC. | | 401 HANOVER AVENUE STATEN ISLAND NY 10304 | 01/11/2021 | 01/11/2026 |
| DOL | DOL | ****5078 | BLACK RIVER TREE REMOVAL, LLC | | 29807 ANDREWS ROAD BLACK RIVER NY 13032 | 10/17/2023 | 10/17/2028 |
| DOL | DOL | | BRADLEY J SCHUKA | | 4 BROTHERS ROAD WAPPINGERS FALLS NY 12590 | 10/20/2020 | 10/20/2025 |
| DOL | DOL | *****9383 | C.C. PAVING AND EXCAVATING, INC. | | 2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | *****4083 | C.P.D. ENTERPRISES, INC | | P.O BOX 281 WALDEN NY 12586 | 03/03/2020 | 03/03/2025 |
| DOL | DOL | *****5161 | CALADRI DEVELOPMENT CORP. | | 1223 PARK ST. PEEKSKILL NY 10566 | 05/17/2021 | 05/17/2026 |
| DOL | DOL | *****3391 | CALI ENTERPRISES, INC. | | 1223 PARK STREET PEEKSKILL NY 10566 | 05/17/2021 | 05/17/2026 |
| DOL | DOL | *****4155 | CASA BUILDERS, INC. | FRIEDLANDER CONSTRUCTI ON | 64 N PUTT CONNERS ROAD NEW PALTZ NY 12561 | 05/10/2023 | 05/10/2028 |
| DOL | AG | ****7247 | CENTURY CONCRETE CORP | | 2375 RAYNOR ST RONKONKOMA NY 11779 | 08/04/2021 | 08/04/2026 |
| DOL | DOL | *****0026 | CHANTICLEER CONSTRUCTION LLC | | 4 BROTHERS ROAD WAPPINGERS FALLS NY 12590 | 10/20/2020 | 10/20/2025 |
| DOL | NYC | *****2117 | CHARAN ELECTRICAL ENTERPRISES | | 9-11 40TH AVENUE LONG ISLAND CITY NY 11101 | 09/26/2023 | 09/26/2028 |
| DOL | NYC | | CHARLES ZAHRADKA | | 863 WASHINGTON STREET FRANKLIN SQUARE NY 11010 | 03/10/2020 | 03/10/2025 |
| DOL | DOL | | CHRISTOPHER GRECO | | 26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956 | 02/18/2021 | 02/18/2026 |
| DOL | DOL | *****2281 | CORRAO TRUCKING, INC. | | PO BOX 393 NANUET NY 10954 | 09/17/2024 | 09/17/2029 |
| DOL | DOL | | CRAIG JOHANSEN | | 10 SOUTH 5TH ST LOCUST VALLEY NY 11560 | 09/26/2022 | 09/26/2027 |

| DOL | DOL | *****3228 | CROSS-COUNTY LANDSCAPING AND TREE | ROCKLAND | 26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956 | 02/18/2021 | 02/18/2026 |
|-----|-----|-----------|---|----------|--|------------|------------|
| DOL | DOL | ****7619 | SERVICE, INC. DANCO CONSTRUCTION UNLIMITED INC. | SERVICE | 485 RAFT AVENUE HOLBROOK NY 11741 | 10/19/2021 | 10/19/2026 |
| DOL | DOL | | DANIEL ROBERT MCNALLY | | 7 GREENFIELD DRIVE WARWICK NY 10990 | 03/25/2022 | 03/25/2027 |
| DOL | DOL | | DARIAN L COKER | | 2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | | DARWIN PEGUESE | | 6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228 | 10/24/2024 | 10/24/2029 |
| DOL | DOL | | DAVID FRIEDLANDER | | 64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561 | 05/10/2023 | 05/10/2028 |
| DOL | DOL | | DINA TAYLOR | | 64 N PUTT CONNERS RD NEW PALTZ NY 12561 | 05/10/2023 | 05/10/2028 |
| DOL | DOL | ****5175 | EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC | | 11371 RIDGE RD WOLCOTT NY 14590 | 02/03/2020 | 02/03/2025 |
| DOL | AG | | EDWIN HUTZLER | | 23 NORTH HOWELLS RD BELLPORT NY 11713 | 08/04/2021 | 08/04/2026 |
| DOL | DA | | EDWIN HUTZLER | | 2375 RAYNOR STREET RONKONKOMA NY 11779 | 08/04/2021 | 08/04/2026 |
| DOL | DOL | *****0780 | EMES HEATING & PLUMBING CONTR | | 5 EMES LANE MONSEY NY 10952 | 01/20/2002 | 01/20/3002 |
| DOL | DOL | | EMIL KISZKO | | 84 DIAMOND ST BROOKLYN NY 11222 | 07/18/2024 | 07/18/2029 |
| DOL | DOL | *****3298 | EMJACK CONSTRUCTION CORP. | | 84 DIAMOND ST BROOKLYN NY 11222 | 07/18/2024 | 07/18/2029 |
| DOL | DOL | *****3298 | EMJACK CONSTRUCTION LLC | | 4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902 | 07/18/2024 | 07/18/2029 |
| DOL | DOL | | EUGENIUSZ "GINO" KUCHAR | | 195 KINGSLAND AVE BROOKLYN NY 11222 | 12/22/2023 | 12/22/2028 |
| DOL | DA | | FREDERICK HUTZLER | | 2375 RAYNOR STREET RONKONKOMA NY 11779 | 08/04/2021 | 08/04/2026 |
| DOL | DOL | *****2998 | G.E.M. AMERICAN CONSTRUCTION CORP. | | 195 KINGSLAND AVE BROOKLYN NY 11222 | 12/22/2023 | 12/22/2028 |
| DOL | NYC | | GAYATRI MANGRU | | 21 DAREWOOD LANE VALLEY STREAM NY 11581 | 09/17/2020 | 09/17/2025 |
| DOL | DA | | GEORGE LUCEY | | 150 KINGS STREET BROOKLYN NY 11231 | 01/19/1998 | 01/19/2998 |
| DOL | DA | | GIOVANNA TRAVALJA | | 3735 9TH ST LONG ISLAND CITY NY 11101 | 01/05/2023 | 01/05/2028 |
| DOL | DA | | GIOVANNI NAPOLITANO | | 2501 BAYVIEW AVENUE WANTAGH NY 11793 | 02/21/2024 | 02/21/2029 |
| DOL | DA | *****0213 | GORILLA CONTRACTING GROUP, LLC | | 505 MANHATTAN AVE WEST BABYLON NY 11704 | 10/05/2023 | 10/05/2028 |
| DOL | DA | ****4760 | GTX CONSTRUCTION ASSOCIATES, CORP | | 2501 BAYVIEW AVE WANTAGH NY 11793 | 02/21/2024 | 02/21/2029 |
| DOL | DOL | | HANS RATH | | 24 ELDOR AVENUE NEW CITY NY 10956 | 02/03/2020 | 02/03/2025 |
| DOL | DOL | | HERBERT CLEMEN | | 42 FOWLER AVENUE CORTLAND MANOR NY 10567 | 01/24/2023 | 01/24/2028 |
| DOL | DOL | | HERBERT CLEMEN | | 42 FOWLER AVENUE CORTLAND MANOR NY 10567 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | *****2397 | ISLAND BREEZE MARINE, INC. | | 6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228 | 10/24/2024 | 10/24/2029 |
| DOL | DOL | *****9211 | J. WASE CONSTRUCTION CORP. | | 8545 RT 9W ATHENS NY 12015 | 03/09/2021 | 03/09/2026 |
| DOL | DOL | | J.M.J CONSTRUCTION | | 151 OSTRANDER AVENUE SYRACUSE NY 13205 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | J.R. NELSON CONSTRUCTION | | 531 THIRD STREET ALBANY NY 12206 | 11/07/2023 | 11/07/2028 |
| DOL | DOL | | J.R. NELSON CONSTRUCTION | | 531 THIRD STREET ALBANY NY 12206 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | | J.R. NELSON CONSTRUCTION | | 531 THIRD STREET ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | | J.R. NELSON, LLC | | 531 THIRD STREET ALBANY NY 12206 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | | J.R. NELSON, LLC | | 531 THIRD STREET ALBANY NY 12206 | 11/07/2023 | 11/07/2028 |
| DOL | DOL | | J.R. NELSON, LLC | | 531 THIRD STREET ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | | J.R.N COMPANIES, LLC | | 531 THIRD STREET ALBANY NY 12206 | 12/12/2022 | 12/12/2027 |

| DOL | DOL | | J.R.N COMPANIES, LLC | J.R.N COMPANIES, LLC 531 THIRD STREET ALBANY NY 12206 | | 11/07/2023 | 11/07/2028 |
|-----|-----|-----------|---|--|---|------------|------------|
| DOL | DOL | | J.R.N COMPANIES, LLC | | 531 THIRD STREET ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | *****1147 | J.R.N. CONSTRUCTION, LLC | | 531 THIRD ST ALBANY NY 12206 | 11/07/2023 | 11/07/2028 |
| DOL | DOL | ****1147 | J.R.N. CONSTRUCTION, LLC | | 531 THIRD ST ALBANY NY 12206 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | ****1147 | J.R.N. CONSTRUCTION, LLC | | 531 THIRD ST ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | | JAMES J. BAKER | | 7901 GEE ROAD CANASTOTA NY 13032 | 08/17/2021 | 08/17/2026 |
| DOL | DOL | | JASON P. RACE | | 3469 STATE RT. 69 PERISH NY 13131 | 09/29/2021 | 09/29/2026 |
| DOL | DOL | | JASON P. RACE | | 3469 STATE RT. 69 PERISH NY 13131 | 02/09/2022 | 02/09/2027 |
| DOL | DOL | | JASON P. RACE | | 3469 STATE RT. 69 PERISH NY 13131 | 11/15/2022 | 11/15/2027 |
| DOL | DOL | | JASON P. RACE | | 3469 STATE RT. 69 PERISH NY 13131 | 03/01/2022 | 03/01/2027 |
| DOL | DOL | ****7993 | JBS DIRT, INC. | | 7901 GEE ROAD CANASTOTA NY 13032 | 08/17/2021 | 08/17/2026 |
| DOL | DOL | *****2435 | JEFFEL D. JOHNSON | JMJ7 AND SON | 5553 CAIRNSTRAIL CLAY NY 13041 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION | | C2 EVERGREEN CIRCLE LIVERPOOL NY 13090 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | ****2435 | JEFFREY M. JOHNSON | JMJ7 AND SON | 5553 CAIRNS TRAIL CLAY NY 13041 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JIM PLAUGHER | | 17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | JMJ7 & SON CONSTRUCTION, LLC | | 5553 CAIRNS TRAIL LIVERPOOL NY 13041 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JMJ7 AND SONS CONTRACTORS | | 5553 CAIRNS TRAIL CLAY NY 13041 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JMJ7 CONTRACTORS | | 7014 13TH AVENUE BROOKLYN NY 11228 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JMJ7 CONTRACTORS AND SONS | | 5553 CAIRNS TRAIL CLAY NY 13041 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JMJ7 CONTRACTORS, LLC | | 5553 CAIRNS TRAIL CLAY NY 13041 | 11/21/2022 | 11/21/2027 |
| DOL | DOL | | JOHN MARKOVIC | | 47 MANDON TERRACE HAWTHORN NJ 07506 | 03/29/2021 | 03/29/2026 |
| DOL | DOL | | JOHN WASE | | 8545 RT 9W ATHENS NY 12015 | 03/09/2021 | 03/09/2026 |
| DOL | DOL | | JORGE RAMOS | | 8970 MIKE GARCIA DR MANASSAS VA 20109 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | JOSEPH K. SALERNO | | 1010 TILDEN AVE UTICA NY 13501 | 07/24/2023 | 07/24/2028 |
| DOL | DOL | | JOSEPH K. SALERNO II | | 1010 TILDEN AVE UTICA NY 13501 | 07/24/2023 | 07/24/2028 |
| DOL | DOL | ****5116 | JP RACE PAINTING, INC. T/A RACE PAINTING | | 3469 STATE RT. 69 PERISH NY 13131 | 02/09/2022 | 02/09/2027 |
| DOL | DOL | ****5116 | JP RACE PAINTING, INC. T/A RACE PAINTING | | 3469 STATE RT. 69 PERISH NY 13131 | 11/15/2022 | 11/15/2027 |
| DOL | DOL | ****5116 | JP RACE PAINTING, INC. T/A RACE PAINTING | | 3469 STATE RT. 69 PERISH NY 13131 | 09/29/2021 | 09/29/2026 |
| DOL | DOL | ****5116 | JP RACE PAINTING, INC. T/A RACE PAINTING | | 3469 STATE RT. 69 PERISH NY 13131 | 03/01/2022 | 03/01/2027 |
| DOL | DOL | ****5116 | JP RACE PAINTING, INC. T/A RACE PAINTING | | 3469 STATE RT. 69 PERISH NY 13131 | 03/01/2022 | 03/01/2027 |
| DOL | DOL | | JRN CONSTRUCTION CO, LLC | | 1024 BROADWAY ALBANY NY 12204 | 11/07/2023 | 11/07/2028 |
| DOL | DOL | *****1147 | JRN CONSTRUCTION, LLC | | 531 THIRD STREET ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | ****1147 | JRN CONSTRUCTION, LLC | | 531 THIRD STREET ALBANY NY 12206 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | ****1147 | JRN CONSTRUCTION, LLC | | 531 THIRD STREET ALBANY NY 12206 | 11/07/2023 | 11/07/2028 |
| DOL | DOL | | JRN PAVING, LLC | | 531 THIRD STREET ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | | JRN PAVING, LLC | | 531 THIRD STREET ALBANY NY 12206 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | | JRN PAVING, LLC | | 531 THIRD STREET ALBANY NY 12206 | 11/07/2023 | 11/07/2028 |

| DOL | DOL | | JULIUS AND GITA BEHREND | 5 EMES LANE | 11/20/2002 | 11/20/3002 |
|-----|-----|-----------|---|--|------------------|------------|
| | | | | MONSEY NY 10952 | | |
| DOL | DOL | | KARIN MANGIN | 796 PHELPS ROAD FRANKLIN LAKES NJ 07417 | 12/01/2020 | 12/01/2025 |
| DOL | DOL | | KATE E. CONNOR | 7088 INTERSTATE ISLAND RD SYRACUSE NY 13209 | 03/31/2021 | 03/31/2026 |
| DOL | DOL | | KEAN INDUSTRIES, LLC | 2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533 | SUITE 2NHOPEWELL | |
| DOL | DOL | *****2959 | KELC DEVELOPMENT, INC | 7088 INTERSTATE ISLAND RD SYRACUSE NY 13209 | 03/31/2021 | 03/31/2026 |
| DOL | DOL | | KIMBERLY F. BAKER | 7901 GEE ROAD CANASTOTA NY 13032 | 08/17/2021 | 08/17/2026 |
| DOL | DOL | | KMA GROUP II, INC. | 29-10 38TH AVENUE LONG ISLAND CITY NY 11101 | 10/11/2023 | 10/11/2028 |
| DOL | DOL | *****1833 | KMA GROUP INC. | 29-10 38TH AVENUE LONG ISLAND CITY NY 11101 | 10/11/2023 | 10/11/2028 |
| DOL | DOL | | KMA INSULATION, INC. | 29-10 38TH AVENUE LONG ISLAND CITY NY 11101 | 10/11/2023 | 10/11/2028 |
| DOL | DOL | | KRIN HEINEMANN | 2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533 | 12/18/2023 | 12/18/2028 |
| DOL | NYC | | KULWANT S. DEOL | 9-11 40TH AVENUE LONG ISLAND CITY NY 11101 | 09/26/2023 | 09/26/2028 |
| DOL | DA | *****8816 | LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION | 150 KINGS STREET BROOKLYN NY 11231 | 08/19/1998 | 08/19/2998 |
| DOL | DOL | | LEROY E. NELSON JR | 531 THIRD ST ALBANY NY 12206 | 10/25/2022 | 10/25/2027 |
| DOL | DOL | | LEROY E. NELSON JR | 531 THIRD ST ALBANY NY 12206 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | | LEROY E. NELSON JR | 531 THIRD ST | 11/07/2023 | 11/07/2028 |
| DOL | AG | *****3291 | LINTECH ELECTRIC, INC. | 3006 TILDEN AVE BROOKLYN NY 11226 | | |
| DOL | DOL | | LOUIS A. CALICCHIA | 1223 PARK ST. PEEKSKILL NY 10566 | 05/17/2021 | 05/17/2026 |
| DOL | NYC | | LUBOMIR PETER SVOBODA | 27 HOUSMAN AVE STATEN ISLAND NY 10303 | 12/26/2019 | 12/26/2024 |
| DOL | NYC | | M & L STEEL & ORNAMENTAL IRON CORP. | 27 HOUSMAN AVE STATEN ISLAND NY 10303 | 12/26/2019 | 12/26/2024 |
| DOL | DOL | ****2196 | MAINSTREAM SPECIALTIES, INC. | 11 OLD TOWN RD SELKIRK NY 12158 | 02/02/2021 | 02/02/2026 |
| DOL | DA | | MANUEL P TOBIO | 150 KINGS STREET BROOKLYN NY 14444 | 08/19/1998 | 08/19/2998 |
| DOL | DA | | MANUEL TOBIO | 150 KINGS STREET BROOKLYN NY 11231 | 08/19/1998 | 08/19/2998 |
| DOL | DOL | | MAQSOOD AHMAD | 618 OCEAN PKWY BROOKLYN NY 11230 | 09/17/2020 | 09/17/2025 |
| DOL | NYC | | MARIA NUBILE | 84-22 GRAND AVENUE ELMHURST NY 11373 | 03/10/2020 | 03/10/2025 |
| DOL | DOL | *****1320 | MJC MASON CONTRACTING, | 42 FOWLER AVENUE | 10/25/2022 | 10/25/2027 |
| DOL | DOL | *****1320 | INC. MJC MASON CONTRACTING, | CORTLAND MANOR NY 10567 42 FOWLER AVENUE | 01/24/2023 | 01/24/2028 |
| DOL | NYC | | INC. MUHAMMED A. HASHEM | CORTLAND MANOR NY 10567 524 MCDONALD AVENUE | 09/17/2020 | 09/17/2025 |
| DOL | NYC | | NAMOW, INC. | BROOKLYN NY 11218 84-22 GRAND AVENUE | 03/10/2020 | 03/10/2025 |
| DOL | DOL | *****7790 | NATIONAL BUILDING & | ELMHURST NY 11373 1010 TILDEN AVE | 07/24/2023 | 07/24/2028 |
| DOL | DOL | *****1797 | RESTORATION CORP NATIONAL CONSTRUCTION | UTICA NY 13501 1010 TILDEN AVE | 07/24/2023 | 07/24/2028 |
| DOL | NYC | | SERVICES, INC NAVIT SINGH | UTICA NY 13501 402 JERICHO TURNPIKE | 08/10/2022 | 08/10/2027 |
| DOL | DOL | | NELCO CONTRACTING, LLC | NEW HYDE PARK NY 11040 1024 BROADWAY | 11/07/2023 | 11/07/2028 |
| DOL | DA | | NICHOLAS T. ANALITIS | ALBANY NY 12204 505 MANHATTAN AVE | 10/05/2023 | 10/05/2028 |
| DOL | DOL | | NICHOLE E. FRASER A/K/A | WEST BABYLON NY 11704 3469 STATE RT. 69 | 03/01/2022 | 03/01/2027 |
| DOL | DOL | | NICHOLE RACE NICHOLE E. FRASER A/K/A | PERISH NY 13131 3469 STATE RT. 69 | 11/15/2022 | 11/15/2027 |
| DOL | DOL | | NICHOLE E. FRASER A/K/A | PERISH NY 13131 3469 STATE RT. 69 | 09/29/2021 | 09/29/2026 |
| DOL | | | NICHOLE E. FRASER A/K/A NICHOLE RACE | PERISH NY 13131 | 0312312021 | 03/28/2020 |

| DOL | DOL | | NICHOLE E. FRASER A/K/A NICHOLE RACE | | 3469 STATE RT. 69 PERISH NY 13131 | 02/09/2022 | 02/09/2027 |
|-----|-----|-----------|--|------------------------------------|--|------------|------------|
| DOL | DOL | ****7429 | NICOLAE I. BARBIR | BESTUCCO CONSTRUCTI ON, INC. | 444 SCHANTZ ROAD ALLENTOWN PA 18104 | 09/17/2020 | 09/17/2025 |
| DOL | NYC | ****5643 | NYC LINE CONTRACTORS, INC. | ON, INC. | 402 JERICHO TURNPIKE NEW HYDE PARK NY 11040 | 08/10/2022 | 08/10/2027 |
| DOL | DOL | | PATRICK PENNACCHIO | | | 12/18/2023 | 12/18/2028 |
| DOL | DOL | | PATRICK PENNACCHIO | | 2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533 | 12/18/2023 | 12/18/2028 |
| DOL | DOL | | PAULINE CHAHALES | | 935 S LAKE BLVD MAHOPAC NY 10541 | 03/02/2021 | 03/02/2026 |
| DOL | DOL | | PETER STEVENS | | 11 OLD TOWN ROAD SELKIRK NY 12158 | 02/02/2021 | 02/02/2026 |
| DOL | DOL | | PETER STEVENS | | 8269 21ST ST BELLEROSE NY 11426 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | *****4168 | PHANTOM CONSTRUCTION CORP. | | 95-27 116TH STREET QUEENS NY 11419 | 07/12/2024 | 07/12/2029 |
| DOL | DOL | ****4168 | PHANTOM CONSTRUCTION CORP. | | 95-27 116TH STREET QUEENS NY 11419 | 05/28/2024 | 05/28/2029 |
| DOL | DOL | *****0466 | PRECISION BUILT FENCES, INC. | | 1617 MAIN ST PEEKSKILL NY 10566 | 03/03/2020 | 03/03/2025 |
| DOL | NYC | | RASHEL CONSTRUCTION CORP | | 524 MCDONALD AVENUE BROOKLYN NY 11218 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | *****1068 | RATH MECHANICAL CONTRACTORS, INC. | | 24 ELDOR AVENUE NEW CITY NY 10956 | 02/03/2020 | 02/03/2025 |
| DOL | DOL | *****2633 | RAW POWER ELECTRIC CORP. | | 3 PARK CIRCLE MIDDLETOWN NY 10940 | 07/11/2022 | 07/11/2027 |
| DOL | DA | *****7559 | REGAL CONTRACTING INC. | | 24 WOODBINE AVE NORTHPORT NY 11768 | 10/01/2020 | 10/01/2025 |
| DOL | DOL | | RICHARD REGGIO | | 1617 MAIN ST PEEKSKILL NY 10566 | 03/03/2020 | 03/03/2025 |
| DOL | DOL | | ROBBYE BISSESAR | | 89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427 | 01/11/2003 | 01/11/3003 |
| DOL | DOL | | ROMEO WARREN | | 161 ROBYN RD MONROE NY 10950 | 07/11/2022 | 07/11/2027 |
| DOL | DOL | ****7172 | RZ & AL INC. | | 198 RIDGE AVENUE VALLEY STREAM NY 11581 | 06/06/2022 | 06/06/2027 |
| DOL | DOL | | SAL FRESINA MASONRY CONTRACTORS, INC. | | 1935 TEALL AVENUE SYRACUSE NY 13206 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | SAL MASONRY CONTRACTORS, INC. | | (SEE COMMENTS) SYRACUSE NY 13202 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | *****9874 | SALFREE ENTERPRISES INC | | P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | SALVATORE A FRESINA A/K/A SAM FRESINA | | 107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | SAM FRESINA | | 107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218 | 07/16/2021 | 07/16/2026 |
| DOL | DA | *****0476 | SAMCO ELECTRIC CORP. | | 3735 9TH ST LONG ISLAND CITY NY 11101 | 01/05/2023 | 01/05/2028 |
| DOL | NYC | *****1130 | SCANA CONSTRUCTION CORP. | | 863 WASHINGTON STREET FRANKLIN SQUARE NY 11010 | 03/10/2020 | 03/10/2025 |
| DOL | DOL | *****2045 | SCOTT DUFFIE | DUFFIE'S ELECTRIC, INC. | P.O BOX 111 CORNWALL NY 12518 | 03/03/2020 | 03/03/2025 |
| DOL | DOL | | SCOTT DUFFIE | | P.O BOX 111 CORNWALL NY 12518 | 03/03/2020 | 03/03/2025 |
| DOL | DA | | SILVANO TRAVALJA | | 3735 9TH ST LONG ISLAND CITY NY 11101 | 01/05/2023 | 01/05/2028 |
| DOL | DOL | ****0440 | SOLAR GUYS INC. | | 8970 MIKE GARCIA DR MANASSAS VA 20109 | 07/16/2021 | 07/16/2026 |
| DOL | NYC | | SOMATIE RAMSUNAHAI | | 115-46 132ND ST SOUTH OZONE PARK NY 11420 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | *****2221 | SOUTH BUFFALO ELECTRIC, INC. | | 1250 BROADWAY ST BUFFALO NY 14212 | 02/03/2020 | 02/03/2025 |
| DOL | NYC | ****3661 | SPANIER BUILDING MAINTENANCE CORP | | 200 OAK DRIVE SYOSSET NY 11791 | 03/14/2022 | 03/14/2027 |
| DOL | DOL | | STANADOS KALOGELAS | | 485 RAFT AVENUE HOLBROOK NY 11741 | 10/19/2021 | 10/19/2026 |

| DOL | DOL | *****3496 | STAR INTERNATIONAL INC | IONAL INC 89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427 | | 08/11/2003 | 08/11/3003 |
|-----|-----|-----------|---|---|--|------------|------------|
| DOL | DOL | ****9528 | STEEL-IT, LLC. | | 17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | ****3800 | SUBURBAN RESTORATION CO. INC. | | 5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410 | 03/29/2021 | 03/29/2026 |
| DOL | DOL | *****9150 | SURGE INC. | | 8269 21ST STREET BELLEROSE NY 11426 | 12/22/2022 | 12/22/2027 |
| DOL | DOL | | SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI | | 4307 28TH AVE ASTORIA NY 11103 | 10/11/2024 | 10/11/2029 |
| DOL | DOL | | SYED RAZA | | 198 RIDGE AVENUE NY 11581 | 06/06/2022 | 06/06/2027 |
| DOL | DOL | | TARLOK SINGH | | 95-27 116TH STREET QUEENS NY 11419 | 05/28/2024 | 05/28/2029 |
| DOL | DOL | | TARLOK SINGH | | 95-27 116TH STREET QUEENS NY 11419 | 07/12/2024 | 07/12/2029 |
| DOL | DOL | | TERRY THOMPSON | | 11371 RIDGE RD WOLCOTT NY 14590 | 02/03/2020 | 02/03/2025 |
| DOL | DOL | ****9733 | TERSAL CONSTRUCTION SERVICES INC | | 107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | TERSAL CONTRACTORS, INC. | | 221 GARDNER RD P.O BOX 14POMPEI NY 13138 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | | TERSAL DEVELOPMENT CORP. | | 1935 TEALL AVENUE SYRACUSE NY 13206 | 07/16/2021 | 07/16/2026 |
| DOL | DOL | ****5766 | THE COKER CORPORATION | COKER CORPORATIO N | 2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | *****2426 | THE MATRUKH GROUP, INC. | | 4307 28TH AVE PO BOX 9082ASTORIA NY 11103 | 10/11/2024 | 10/11/2029 |
| DOL | DOL | | TIMOTHY PERCY | | 29807 ANDREWS ROAD BLACK RIVER NY 13612 | 10/17/2023 | 10/17/2028 |
| DOL | DA | *****1050 | TRI STATE CONSTRUCTION OF NY CORP. | | 50-39 175TH PLACE FRESH MEADOWS NY 11365 | 03/28/2022 | 03/28/2027 |
| DOL | DA | *****4106 | TRIPLE H CONCRETE CORP | | 2375 RAYNOR STREET RONKONKOMA NY 11779 | 08/04/2021 | 08/04/2026 |
| DOL | DOL | ****8210 | UPSTATE CONCRETE & MASONRY CONTRACTING CO INC | | 449 WEST MOMBSHA ROAD MONROE NY 10950 | 06/06/2022 | 06/06/2027 |
| DOL | DOL | *****6418 | VALHALLA CONSTRUCTION, LLC. | | 796 PHLEPS ROAD FRANKLIN LAKES NJ 07417 | 12/01/2020 | 12/01/2025 |
| DOL | NYC | ****2426 | VICKRAM MANGRU | VICK CONSTRUCTI ON | 21 DAREWOOD LANE VALLEY STREAM NY 11581 | 09/17/2020 | 09/17/2025 |
| DOL | NYC | | VICKRAM MANGRU | | 21 DAREWOOD LANE VALLEY STREAM NY 11581 | 09/17/2020 | 09/17/2025 |
| DOL | DOL | | VIKTORIA RATH | | 24 ELDOR AVENUE NEW CITY NY 10956 | 02/03/2020 | 02/03/2025 |
| DOL | DOL | | VINCENT CORRAO | | PO BOX 393 NANUET NY 10954 | 09/17/2024 | 09/17/2029 |
| DOL | DOL | ****8266 | WILLIAM CHRIS MCCLENDON | MCCLENDON ASPHALT PAVING | 1646 FALLS STREET NIAGARA FALLS NY 14303 | 05/01/2023 | 05/01/2028 |
| DOL | DOL | | WILLIAM CHRIS MCCLENDON | | 1646 FALLS STREET NIAGARA FALLS NY 14303 | 05/01/2023 | 05/01/2028 |
| DOL | DOL | | WILLIAM G. PROERFRIEDT | | 85 SPRUCEWOOD ROAD WEST BABYLON NY 11704 | 01/19/2021 | 01/19/2026 |
| DOL | DOL | ****5924 | WILLIAM G. PROPHY, LLC | WGP CONTRACTIN G, INC. | 54 PENTAQUIT AVE BAYSHORE NY 11706 | 01/19/2021 | 01/19/2026 |
| DOL | DOL | | WILLIAM SCRIVENS | | 4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902 | 07/18/2024 | 07/18/2029 |
| DOL | DOL | | XENOFON EFTHIMIADIS | | 29-10 38TH AVENUE LONG ISLAND CITY NY 11101 | 10/11/2023 | 10/11/2028 |

RAFT AIA Document A132[™] - 2009

Standard Form of Agreement Between Owner and

Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the « TBD » day of «TBD » in the year «2025 » (In words, indicate day, month and year.)

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

Thiells Roseville Fire District 99 West Ramapo Road, Garnerville, New York, 10923

« »« » «→ (())

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

« »« » « » « » « »

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

New 26-100 Fire Headquarters 65 W Ramapo Road Garnerville, New York 10923 « «→>

~~>>

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

The Palombo Group 22 Noxon Street Poughkeepsie, New York 12601

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

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

 \leftrightarrow

 \leftrightarrow

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.

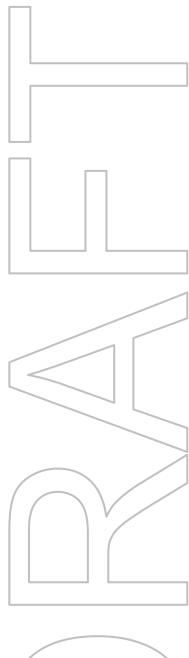
This document is intended to be used in conjunction with AIA Documents A232™-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132[™]-2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132^{™-} 2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser. ^AIA Document A232[™]-2009 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

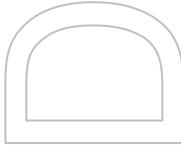


ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

The Owner and Contractor agree as follows.





AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and for resale. (793266254)

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
- **INSURANCE AND BONDS** 10

EXHIBIT A DETERMINATION OF THE COST OF THE WORK

THE CONTRACT DOCUMENTS ARTICLE 1

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 Modifications, 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 the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner. (Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

« »

If, prior to the commencement of the Work, the Owner requires time to file mortgages, mechanics' liens and other security interests, the Owner's time requirement shall be as follows:

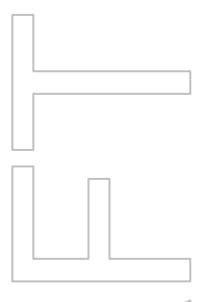
« »

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

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than «Three Hundred and Eighty- » («380») days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

« »



AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 3 possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

| Portion | of the Work | Substantial Completion Date | |
|--|---|---|--|
| (Insert provision | stments of this Contract Time as prov as, if any, for liquidated damages rela for early completion of the Work.) | | |
| « » | | | |
| § 4.1 The Owne | ONTRACT SUM r shall pay the Contractor the Contra ontract Sum shall be one of the follo <i>opriate box.)</i> | | he Contractor's performance of the |
| [« <u>X</u> » |] Stipulated Sum, in accordance with | h Section 4.2 below | |
| [« »] | Cost of the Work plus the Contract with Section 4.3 below | tor's Fee without a Guarantee | ed Maximum Price, in accordance |
| [« »] | Cost of the Work plus the Contract Section 4.4 below | tor's Fee with a Guaranteed N | Maximum Price, in accordance with |
| | election above, complete Section 4.2, 1.4, 5.1.5 or 5.1.6 below.) | 4.3 or 4.4 below. Based on the | he selection above, also complete |
| § 4.2 Stipulated § 4.2.1 The Stip Documents. | Sum ulated Sum shall be <mark>« »</mark> (\$ « »), suł | oject to additions and deletior | ns as provided in the Contract |
| and are hereby a (State the number Owner to accept | ulated Sum is based on the following accepted by the Owner: ers or other identification of accepted to ther alternates subsequent to the e ing the amount for each and the date | d alternates. If the bidding or xecution of this Agreement, a | proposal documents permit the |
| § 4.2.3 Unit pric (<i>Identify and sta</i> | es, if any: te the unit price, and state the quant | ity limitations, if any, to whic | ch the unit price will be applicable.) |
| ltem | | Units and Limitations | Price per Unit (\$0.00) |

§ 4.2.4 Allowances included in the Stipulated Sum, if any: (Identify allowance and state exclusions, if any, from the allowance price.)

| <mark>ltem</mark> Allowances | Allowance As indicated on the proposal sheet | | |
|--|--|--------------------------|--|
| st of the Work Plus Contractor's Fee with the Contract Sum is the Cost of the Work as of the Wor | | e Cost of the Work, plus | |

§ §

the Contractor's Fee.

§ 4.3.2 The Contractor's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

« »

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« »%) of the standard rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:

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

| ltem | Units and Limitations | Price per Unit (\$0.00) |
|------|-----------------------|-------------------------|
| | | |

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager for the Owner, in writing, a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the items in Section A.1 of Exhibit A, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Contract Sum is the Cost of the Work as defined in Exhibit A, Determination of the Cost of the Work, plus the Contractor's Fee.

§ 4.4.2 The Contractor's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:

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

| Item | Units and Limitations | Price per Unit (\$0.00) |
|------|-----------------------|-------------------------|
| | | |

§ 4.4.7 Guaranteed Maximum Price

§ 4.4.7.1 The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed « » (\$ « »), subject to additions and deductions by changes in the Work as provided in the Contract Documents. Such maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner. (Insert specific provisions if the Contractor is to participate in any savings.)

« »

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 4.4.7.2 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:



§ 4.4.7.3 Allowances included in the Guaranteed Maximum Price, if any:

(Identify and state the amounts of any allowances, and state whether they include labor, materials, or both.)

| Item | | Allowance | |
|--|--|--|---|
| § 4.4.7.4 Ass | umptions, if any, on which the Guarantee | ed Maximum Price is based: | |
| « » | | | |
| certification for Payment | PAYMENTS as Payments I upon Applications for Payment submitte of the Project Application and Project Cer by the Construction Manager and Archited account of the Contract Sum to the Contr | tificate for Payment or Application fo ct and issuance by the Architect, the O | r Payment and Certificate wner shall make progress |
| § 5.1.2 The p month, or as | eriod covered by each Application for Par follows: | yment shall be one calendar month en | ding on the last day of the |
| <u>In keeping w</u> ≪→> | ith requirements of the Owner's standard | procedures. | |
| a month, the later than the the application Construction | ded that an Application for Payment is rec Owner shall make payment of the certifie « » day of the « » month. If an Applicat on date fixed above, payment shall be mad Manager receives the Application for Pay te or local laws may require payment with | ed amount in the Application for Payn tion for Payment is received by the Co de by the Owner not later than « » (« yment. | nent to the Contractor not onstruction Manager after |
| § 5.1.4.1 Eac Contractor in among the va accuracy as t Construction § 5.1.4.2 App | ess Payments Where the Contract Sum h Application for Payment shall be based accordance with the Contract Documents arious portions of the Work and be prepar he Construction Manager and Architect n Manager or Architect, shall be used as a plications for Payment shall show the perc covered by the Application for Payment. | on the most recent schedule of values s. The schedule of values shall allocat red in such form and supported by suc nay require. This schedule, unless obj basis for reviewing the Contractor's A centage of completion of each portion | e the entire Contract Sum h data to substantiate its ected to by the Applications for Payment. |
| - | | , i | |
| § 5.1.4.3 Sub as follows: .1 .2 | ject to the provisions of the Contract Docu Take that portion of the Contract Sum p multiplying the percentage completion Sum allocated to that portion of the Wo >> %). Pending final determination of co may be included as provided in Section Add that portion of the Contract Sum p suitably stored at the site for subsequent advance by the Owner, suitably stored o style="text-align: center;" | properly allocable to completed Work of each portion of the Work by the sh rk in the schedule of values, less retain st to the Owner of changes in the Work 7.3.9 of the General Conditions; roperly allocable to materials and equ t incorporation in the completed const | as determined by are of the total Contract nage of |

Subtract the aggregate of previous payments made by the Owner; and .3

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

.4 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of the General Conditions.

§ 5.1.4.4 The progress payment amount determined in accordance with Section 5.1.4.3 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to « » percent (« » %) of the Contract Sum, less such amounts as the Construction Manager recommends and the Architect determines for incomplete Work and unsettled claims; and
- Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, .2 any additional amounts payable in accordance with Section 9.10.3 of the General Conditions.

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

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.4.3.1 and 5.1.4.3.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

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

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit A, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work. equal or exceed (1) progress payments already received by the Contractor; less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- Take the Cost of the Work as described in Exhibit A, Determination of the Cost of the Work; .1
- .2 Add the Contractor's Fee, less retainage of « » percent (« » %). The Contractor's Fee shall be computed upon the Cost of the Work described in that Section at the rate stated in that Section; or if the Contractor's Fee is stated as a fixed sum, an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- .3 Subtract retainage of « » percent (« » %) from that portion of the Work that the Contractor self-performs;
- .4 Subtract the aggregate of previous payments made by the Owner;
- .5 Subtract the shortfall, if any, indicated by the Contractor in the documentation required by Article 5 or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- .6 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or withdrawn a Certificate for Payment as provided in Section 9.5 of AIA Document A232TM-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon (1) a mutually acceptable procedure for review and approval of payments to Subcontractors and (2) the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and shall not be deemed to represent that the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used

AIA Document A132²⁰ - 2009 (formerly A101²⁰CMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 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.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed **Maximum Price**

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner or Architect to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor; less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 5.1.6.2 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 and be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.3 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. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work for which the Contractor has made or intends to make actual payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values. Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.10 of AIA Document A232-2009;
- .2 Add that portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work, or if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
- Add the Contractor's Fee, less retainage of « » percent (« » %). The Contractor's Fee shall be .3 computed upon the Cost of the Work at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, shall be an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- Subtract retainage of « » percent (« » %) from that portion of the Work that the Contractor .4 self-performs;
- Subtract the aggregate of previous payments made by the Owner; .5
- Subtract the shortfall, if any, indicated by the Contractor in the documentation required by Section .6 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- Subtract amounts, if any, for which the Construction Manager or Architect have withheld or nullified a .7 Certificate for Payment as provided in Section 9.5 of AIA Document A232-2009.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a (1) mutually acceptable procedure for review and approval of payments to Subcontractors and (2) the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and shall not be deemed to represent that the Construction Manager or Architect have made a detailed examination, audit or arithmetic

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 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 Section 12.2 of AIA Document A232–2009, and to satisfy other requirements, if any, which extend beyond final payment;
- .2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit A, Determination of the Cost of the Work when payment is on the basis of the Cost of the Work, with or without a Guaranteed Maximum payment; and
- .3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« »

ARTICLE 6 DISPUTE RESOLUTION § 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A232–2009, unless the parties appoint below another individual, not a party to this Agreement, to serve as 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.)

« »

« »

« »

« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A232-2009, the method of binding dispute resolution shall be as follows:

(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, 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.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A232–2009.

[**« X »**] Litigation in a court of competent jurisdiction.

[« »] Other: (Specify)

« »

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232-2009.

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2009.

AIA Document A132^M - 2009 (formerly A101^MCMA - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution 9 of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price § 7.2.1 Subject to the provisions of Section 7.2.2 below, the Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2009.

§ 7.2.2 The Contract may be terminated by the Owner for cause as provided in Article 14 of AIA Document A232– 2009; however, the Owner shall then only pay the Contractor an amount calculated as follows:

- .1 Take the Cost of the Work incurred by the Contractor to the date of termination;
- .2 Add the Contractor's Fee computed upon the Cost of the Work to the date of termination at the rate stated in Sections 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion; and
- .3 Subtract the aggregate of previous payments made by the Owner.

§ 7.2.3 If the Owner terminates the Contract for cause when the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, and as provided in Article 14 of AIA Document A232-2009, the amount, if any, to be paid to the Contractor under Section 14.2.4 of AIA Document A232-2009 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.2.

§ 7.2.4 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders.

§ 7.2.5 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2009; in such case, the Contract Sum and Contract Time shall be increased as provided in Section 14.3.2 of AIA Document A232-2009, except that the term 'profit' shall be understood to mean the Contractor's Fee as described in Sections 4.3,2 and 4.4.2 of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2009 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 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.)

« » % « »

§ 8.3 The Owner's representative: (Name, address and other information)

| H2M architects + engineers |
|----------------------------|
| 538 Broad Hollow Road |
| Melville, New York, 11747 |
| « » |
| «→> |

§ 8.4 The Contractor's representative: (Name, address and other information)

AIA Document A132^M - 2009 (formerly A101^MCMA - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 10 possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

| ~ | » |
|----|----------|
| « | » |
| « | » |
| 11 | ~ |

« » « »

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

§ 8.6 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A132–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition.

§ 9.1.2 The General Conditions are AIA Document A232–2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

| Document | Title | Date | | Pages | |
|--|--|-----------------------|----------------------|-------|--|
| | ions: cations here or refer to an ex Table of Contents of the Proje | | Agreement.) | | |
| Section | Title | Date | | Pages | |
| As indicated | | | | | |
| Table of Con | itents | | | | |
| § 9.1.5 The Drawings: (Either list the Drawings here or refer to an exhibit attached to this Agreement.) (*-As indicated in the List of Drawings of the Project Manual** | | | | | |
| Number | | | Dete | | |
| | d in the List of Drawings | Title | Date | | |
| § 9.1.6 The Addenda, | if any: | | | | |
| Number | | Date | Pages | | |
| Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9. | | | | | |
| .1 AIA D | cuments, if any, forming part ocument A132 TM –2009, Exh ocument E201 TM –2007, Digi | ibit A, Determination | of the Cost of the V | | |

« »

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 11 possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

.3 AIA Document E202TM–2008, Building Information Modeling Protocol Exhibit, if completed, or the following:

« »

.4 Other documents, if any, listed below:

(List here any additional documents which are intended to form part of the Contract Documents. AIA Document A232–2009 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

« »

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A232-2009.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A232– 2009.)

Limit of Liability or Bond Amount (\$0.00) Type of Insurance or Bond -As indicated in the Project Manual

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

OWNER (Signature)

« »« »

(Printed name and title)

CONTRACTOR (Signature)

« »« » (Printed name and title)

AIA Document A132^M - 2009 (formerly A101^MCMa - 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:06:33 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (793266254)

RAFT AIA[®] Document A232[™] - 2009

General Conditions of the Contract for Construction,

Construction Manager as Adviser Edition

for the following PROJECT:

(Name, and location or address)

New 26-100 Fire Headquarters 65 W Ramapo Road

THE CONSTRUCTION MANAGER: (Name, legal status and address)

The Palumbo-Palombo Group 22 Noxon Street Poughkeepsie, New York 12601 « »« » «→>

THE OWNER: (Name, legal status and address)

Thiells Roseville Fire District 99 West Ramapo Road, Garnerville, New York, 10923 « »« »

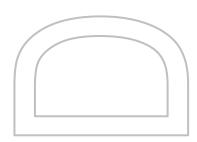
THE ARCHITECT: (Name, legal status and address)

H2M architects + engineers 538 Broad Hollow Road Melville, New York 11747 « »« »

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.

This document is intended to be used in conjunction with AIA Documents A132™-2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132[™]-2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and $C132^{m}-2009$, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

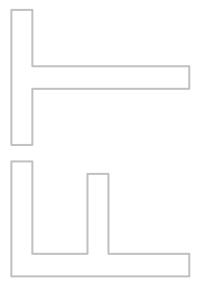


ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

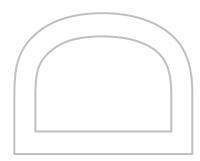
AIA Document A232TM - 2009 (rev. 12/11) (formerly A201TMCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

TABLE OF ARTICLES

- **GENERAL PROVISIONS** 1
- 2 OWNER
- 3 CONTRACTOR
- ARCHITECT AND CONSTRUCTION MANAGER 4
- **SUBCONTRACTORS** 5
- CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS 6
- CHANGES IN THE WORK 7
- 8 TIME
- 9 **PAYMENTS AND COMPLETION**
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 **INSURANCE AND BONDS**
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 **MISCELLANEOUS PROVISIONS**
- TERMINATION OR SUSPENSION OF THE CONTRACT 14
- 15 **CLAIMS AND DISPUTES**







AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

INDEX

(Topics and numbers in **bold** are section headings.)

Acceptance of Nonconforming Work 9.6.6, 9.9.3, 12.3 Acceptance of Work 9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3 Access to Work 3.16, 6.2.1, 12.1 Accident Prevention 10 Acts and Omissions 3.2.1, 3.2.2, 3.3.2, 3.12.8, 3.18, 8.3.1, 9.5.1, 10.1, 10.2.5, 13.4.2, 13.7 Addenda 1.1.1, 3.11, 4.2.14 Additional Costs, Claims for 3.2.4, 3.7.4, 3.7.5, 6.1.1, 7.3, 9.10.3, 9.10.4, 10.3, 10.4, 15.1.4 Additional Inspections and Testing 4.2.8, 12.2.1, 13.5 Additional Insured 11.1.4 Additional Time, Claims for 3.7.4, 3.7.5, 6.1.1, 7.3, 8.3, 10.3 Administration of the Contract 3.10, 4.2 Advertisement or Invitation to Bid 1.1.1 Aesthetic Effect 4.2.19 Allowances 3.8, 7.3.8 All-risk Insurance 11.3.1, 11.3.1.1 **Applications for Payment** 4.2.7, 4.2.15, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.7, 9.8.3, 9.10.1, 9.10.3, 9.10.5, 11.1.3, 14.2.4 Approvals 2.1.1, 2.2.2, 2.4, 3.1.4, 3.10.1, 3.10.2, 3.12.4 through 3.12.10, 3.13.2, 3.15.2, 4.2.9, 9.3.2, 13.4.2, 13.5 Arbitration 8.3.1, 11.3.10, 13.1, 15.3.2, 15.4 ARCHITECT 4 Architect, Certificates for Payment 9.4 Architect, Definition of 4.1.1 Architect, Extent of Authority 5.2, 7.1.2, 7.3.7, 7.4, 9.3.1, 9.4, 9.5, 9.8.3, 9.8.4, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 15.1.3, 15.2.1 Architect, Limitations of Authority and Responsibility 2.1.1, 3.12.8, 4.2.1, 4.2.2, 4.2.8, 4.2.13, 5.2.1, 9.6.4, 15.2 Architect's Additional Services and Expenses 2.4, 11.3.1.1, 12.2.1, 12.2.4, 13.5.2

Architect's Administration of the Contract 4.2, 9.4, 9.5, 15.2 Architect's Approvals 3.12.8 Architect's Authority to Reject Work 4.2.8, 12.1.2, 12.2.1 Architect's Copyright 1.5 Architect's Decisions 4.2.8, 7.3.9, 7.4, 8.1.3, 8.3.1, 9.2, 9.4, 9.5, 9.8.3, 9.9.2, 13.5.2, 14.2.2, 14.2.4, 15.2 Architect's Inspections 3.7.4, 4.2, 9.8.3, 9.9.2, 9.10.1, 13.5 Architect's Instructions 3.2.4, 7.4, 9.4 Architect's Interpretations 4.2.8, 4.2.17, 4.2.18 Architect's On-Site Observations 4.2.2, 9.4, 9.5.1, 9.10.1, 12.1.1, 12.1.2, 13.5 Architect's Project Representative 4.2.16 Architect's Relationship with Contractor 1.1.2, 1.5, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.9.2, 3.9.3, 3.10, 3.11, 3.12.8, 3.16, 3.18, 4.2, 5.2, 6.2.2, 8.2, 11.3.7, 12.1, 13.5 Architect's Relationship with Construction Manager 1.1.2, 9.3 through 9.10, 10.3, 13.5.1, 10.3, 11.3.7, 13.4.2, 13.5.4 Architect's Relationship with Subcontractors 1.1.2, 4.2.8, 5.3, 9.6.3, 9.6.4 Architect's Representations 9.4, 9.5, 9.10.1 Architect's Site Visits 4.2.2, 9.4, 9.5.1, 9.8.3, 9.9.2, 9.10.1, 13.5 Asbestos 10.3.1 Attorneys' Fees 3.18.1, 9.10.2, 10.3.3 Award of Other Contracts 6.1.1, 6.1.2 Award of Subcontracts and Other Contracts for **Portions of the Work** 5.2 **Basic Definitions** 1.1 **Bidding Requirements** 1.1.1, 5.2.1, 11.4.1 Binding Dispute Resolution 9.7, 11.3.9, 11.3.10, 13.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1 **Boiler and Machinery Insurance** 11.3.2 **BONDS, INSURANCE AND** 11

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

Bonds, Lien 7.3.7.4, 9.10.3 Bonds, Performance and Payment 7.3.7.4, 9.6.7, 9.10.3, 11.3.9, 11.4 **Building Permit** 2.2.2, 3.7.1 Capitalization 1.3 Certificate of Substantial Completion 9.8.3, 9.8.4, 9.8.5 **Certificates for Payment** 4.2.2, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 15.1.3 Certificates of Inspection, Testing or Approval 13.5.4 Certificates of Insurance 9.3.2, 9.10.2, 11.1.3 **Change Orders** 1.1.1, 2.4, 3.4.2, 3.7.4, 3.8.2, 3.11, 3.12.8, 4.2.12, 4.2.13, 4.2.14, 5.2.3, 7.1.1, 7.1.2, 7.2, 7.3.2, 7.3.4, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3 Change Orders, Definition of 7.2 Changes 7.1 **CHANGES IN THE WORK** 2.2.1, 3.4.2, 3.11, 3.12.8, 4.2.13, 4.2.14, 7, 8.3.1, 9.3.1.1 Claims, Definition of 15.1.1 CLAIMS AND DISPUTES 1.1.8, 3.2.4, 3.7.5, 6.1.1, 7.3.9, 8.3.2, 9.3.3, 9.10.3, 9.10.4, 10.3.3, 15, 15.4 **Claims for Additional Cost** 3.2.4, 3.7.5, 6.1.1, 7.3.9, 9.10.3, 9.10.4, 10.3.2, 10.4, 15.1.4 **Claims for Additional Time** 3.2.4, 3.7.5, 7, 8.3.2, 10.4, 15.1.5 Concealed or Unknown Conditions, Claims for 3.7 Claims for Damages 3.2.4, 3.18, 6.1.1, 6.2.5, 8.3.2, 9.3.3, 9.5.1.2, 9.10.2, 9.10.5, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 15.1.6 **Cleaning Up** 3.15, 6.3 Commencement of Statutory Limitation Period 13.7 Commencement of the Work, Definition of 8.1.2 Communications, Owner to Architect 2.2.6 Communications, Owner to Construction Manager 2.2.6 Communications, Owner to Contractor 2.2.6

Communications Facilitating Contract Administration 3.9.1. 4.2.6 **COMPLETION, PAYMENTS AND Completion**, Substantial 4.2.15, 8.1.1, 8.1.3, 8.2.3, 9.4.3.3, 9.8, 9.9.1, 9.10.3, 12.2.1, 12.2.2, 13.7 **Concealed or Unknown Conditions** 3.7.4, 4.2.8, 8.3.1, 10.3 Conditions of the Contract 1.1.1 **Consolidation or Joinder** 15.4.4 **CONSTRUCTION BY OWNER OR BY OTHER** CONTRACTORS 1.1.4.6 Construction Change Directive, Definition of 7.3.1 **Construction Change Directives** 1.1.1, 3.4.2, 3.12.8, 4.2.12, 4.2.13, 7.1.1, 7.1.2, 7.1.3, 7.3, 9.3.1.1 Construction Manager, Building Permits 2.2.2 Construction Manager, Communications through 4.2.6 Construction Manager, Construction Schedule 3.10.1, 3.10.3 CONSTRUCTION MANAGER Construction Manager, Definition of 4.1.2 Construction Manager, Documents and Samples at the Site 3.11 Construction Manager, Extent of Authority 3.12.7, 3.12.8, 4.1.3, 4.2.1, 4.2.4, 4.2.5, 4.2.9, 7.1.2, 7.2, 7.3.1, 8.3, 9.3.1, 9.4.1, 9.4.2, 9.4.3, 9.8.2, 9.8.3, 9.8.4, 9.9.1, 12.1, 12.2.1, 14.2.2, 14.2.4 Construction Manager, Limitations of Authority and Responsibility 4.2.5, 4.2.8, 13.4.2 Construction Manager, Submittals 4.2.9 Construction Manager's Additional Services and Expenses 12.2.1 Construction Manager's Administration of the Contract 4.2, 9.4, 9.5 Construction Manager's Approval 2.4, 3.10.1, 3.10.2 Construction Manager's Authority to Reject Work 4.2.8, 12.2.1 Construction Manager's Decisions 7.3.7, 7.3.9, 9.4.1, 9.5.1 Construction Manager's Inspections 4.2.8, 9.8.3, 9.9.2

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

Construction Manager's On-Site Observations 9.5.1 Construction Manager's Relationship with Architect 1.1.2, 4.2.1, 4.2.7, 4.2.8, 4.2.9, 4.2.13, 4.2.15, 4.2.16, 4.2.20, 9.2.1, 9.4.2, 9.5, 9.6.1, 9.6.3, 9.8.2, 9.8.3, 9.8.4, 9.9.1, 9.10.1, 9.10.2, 9.10.3, 11.1.3, 12.2.4, 13.5.1, 13.5.2, 13.5.4, 14.2.2, 14.2.4 Construction Manager's Relationship with Contractor 3.2.2, 3.2.3, 3.3.1, 3.5, 3.10.1, 3.10.2, 3.10.3, 3.11, 3.12.5, 3.12.6, 3.12.7, 3.12.8, 3.12.9, 3.12.10, 3.13.2, 3.14.2, 3.15.2, 3.16, 3.17, 3.18.1, 4.2.4, 4.2.5, 4.2.6, 4.2.9, 4.2.14, 4.2.17, 4.2.20, 5.2, 6.2.1, 6.2.2, 7.1.2, 7.2, 7.3.5, 7.3.7, 7.3.10, 8.3.1, 9.2, 9.3.1, 9.4.1, 9.4.2, 9.7, 9.8.2, 9.8.3, 9.8.4, 9.9.1, 9.10.1, 9.10.2, 9.10.3, 10.1, 10.3, 11.3.7, 12.1, 13.5.1, 13.5.2, 13.5.3, 13.5.4 Construction Manager's Relationship with Owner 2.2.2, 4.2.1, 10.3.2 Construction Manager's Relationship with Other Contractors and Owner's Own Forces 4.2.4 Construction Manager's Relationship with Subcontractors 4.2.8, 5.3, 9.6.3, 9.6.4 Construction Manager's Site Visits 9.5.1 Construction Schedules, Contractor's 3.10, 3.12.1, 3.12.2, 6.1.2, 15.1.5.2 **Contingent Assignment of Subcontracts** 5.4, 14.2.2.2 **Continuing Contract Performance** 15.1.3 Contract, Definition of 1.1.2 CONTRACT, TERMINATION OR SUSPENSION OF THE 5.4.1.1, 11.3.9, 14 Contract Administration 3.1.3, 4.2, 9.4, 9.5 Contract Award and Execution, Conditions Relating to 3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1 Contract Documents, Copies Furnished and Use of 1.5.2, 2.2.5, 5.3 Contract Documents, Definition of 1.1.1 Contract Performance During Arbitration 15.1.3

Contract Sum 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.2, 7.3, 7.4, 9.1, 9.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1.1, 12.3, 14.2.4, 14.3.2, 15.1.4, 15.2.5 Contract Time 3.7.4, 3.7.5, 4, 3.10.2, 5.2.3, 7.2.3, 7.3.1, 7.3.5, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1, 15.2.5 Contract Time, Definition of 8.1.1

CONTRACTOR

Contractor, Definition of 3.1.1

3

Contractor's Construction Schedules

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Contractor's Employees 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1 **Contractor's Liability Insurance**

11.1 Contractor's Relationship with Other Contractors and Owner's Own Forces 3.12.5, 3.14.2, 4.2.6, 6, 11.3, 12.1.2, 12.2.4 Contractor's Relationship with Subcontractors 1.2.2, 3.3.2, 3.18, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8, 14.2.1.2 Contractor's Relationship with the Architect 1.1.2, 1.5, 3.2.2, 3.2.3, 3.2.4, 3.4.2, 3.5, 3.7.4, 3.10.1, 3.11, 3.12, 3.16, 3.18, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1 Contractor's Relationship with the Construction Manager 1.1.2, 3.2.2, 3.2.3, 3.3.1, 3.5, 3.10.1, 3.10.2, 3.10.3, 3.11, 3.12.5, 3.12.7, 3.12.9, 3.12.10, 3.13.2, 3.14.2, 3.15.1, 3.16, 3.17, 3.18.1, 4.2.4, 4.2.5, 5.2, 6.2.1, 6.2.2, 7.1.2, 7.3.5, 7.3.7, 7.3.10, 8.3.1, 9.2, 9.3.1, 9.4.1, 9.4.2, 9.8.2, 9.9.1, 9.10.1, 9.10.2, 9.10.3, 10.1, 10.2.6, 10.3, 11.3.7, 12.1, 13.5.1, 13.5.2, 13.5.3, 13.5.4 Contractor's Representations 3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2 Contractor's Responsibility for Those Performing the Work 3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8 Contractor's Review of Contract Documents 3.2 Contractor's Right to Stop the Work 9.7 Contractor's Right to Terminate the Contract 14.1 Contractor's Submittals 3.10.2, 3.11, 3.12, 4.2.9, 9.2, 9.3, 9.8.2, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2 Contractor's Superintendent 3.9, 10.2.6 Contractor's Supervision and Construction Procedures 1.2.2, 3.3, 3.4, 4.2.5, 4.2.7, 6.1, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3 Contractual Liability Insurance 11.1.1.8, 11.2, 11.3.1.5 Coordination and Correlation 1.2, 3.2, 3.3.1, 3.10, 3.12.6, 6.1.2, 6.2.1 Copies Furnished of Drawings and Specifications 1.5, 2.2.5, 3.11

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

Copyrights 1.5, 3.17 **Correction of Work** 2.3, 2.4, 9.4.1, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2 **Correlation and Intent of the Contract Documents** 1.2 Costs 2.4, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.6, 7.3.7, 7.3.8, 7.3.9, 11.3.1.2, 11.3.1.3, 11.3.4, 11.3.9, 12.1, 12.2.1, 13.5, 14 **Cutting and Patching** 3.14, 6.2.5 Damage to Construction of Owner or Other Contractors 3.14.2, 6.2.4, 9.5.1.5, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4 Damage to the Work 3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 11.3.1, 12.2.4 Damages, Claims for 3.2.4, 3.18, 6.1.1, 8.3.2, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.2.4, 15.1.6 Damages for Delay 6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 15.1.5 Date of Commencement of the Work, Definition of 8.1.2 Date of Substantial Completion, Definition of 8.1.3 Day, Definition of 8.1.4 Decisions of the Architect 3.7.4, 4.2.7, 4.2.8, 4.2.10, 4.2.11, 4.2.13, 4.2.15, 4.2.16, 4.2.17, 4.2.18, 4.2.19, 4.2.20, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5, 9.8.3, 9.8.4, 9.9.1, 10.1.2, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2 Decisions of the Construction Manager 7.3.7, 7.3.8, 7.3.9, 15.1, 15.2 **Decisions to Withhold Certification** 9.4.1, 9.5, 9.7, 14.1.1.3 Defective or Nonconforming Work, Acceptance, Rejection and Correction of 2.3, 2.4, 3.5, 4.2.8, 6.2.5, 9.5.1, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1, 12.2.2 Definitions 1.1, 2.1.1, 3.1.1, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 4.1.2, 7.2, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1 **Delays and Extensions of Time** 3.2, 3.7.4, 5.2.3, 7.2, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.5, 15.2.5 Disputes 7.3.8, 7.3.9, 9.3, 15.1, 15.2 **DISPUTES, CLAIMS AND** 3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 15, 15.4 **Documents and Samples at the Site** 3.11 Drawings, Definition of 1.1.5 Drawings and Specifications, Ownership and Use 1.1.1, **1.5**, 2.2.5, 3.11, 5.3

Duty to Review Contract Documents and Field Conditions 3.2 Effective Date of Insurance 8.2.2. 11.1.2 Emergencies 10.4, 14.1.1.2, 15.1.4 Employees, Contractor's 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.1, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1 Equipment, Labor, Materials and or 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12.2, 3.12.3, 3.13.1, 3.15.1, 4.2.8, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.2 Execution and Progress of the Work 1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3 Extensions of Time 3.2.4, 3.7.4, 5.2.3, 7.2.3, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.5, 15.2.5 **Failure of Payment** 9.5.1.3, 9.7, 13.6, 14.1.1.3, 14.1.3, 14.2.1.2, 15.1.4 Faulty Work (See Defective or Nonconforming Work) **Final Completion and Final Payment** 4.2.1, 4.2.15, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3, 15.2.1 Financial Arrangements, Owner's 2.2.1**GENERAL PROVISIONS** 1 **Governing Law** 13.1 Guarantees (See Warranty and Warranties) **Hazardous Materials** 10.2.4. 10.3 Identification of Contract Documents 1.2.1 Identification of Subcontractors and Suppliers 5.2.1 Indemnification **3.18**, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7 Information and Services Required of the Owner 2.1.2, 2.2, 4.2.6, 6.1.2, 6.2.5, 9.6.1, 9.6.4, 9.8, 9.9.1. 9.10.3, 10.3.2, 10.3.3, 11.2, 11.3.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.3, 15.1.2 **Initial Decision** 15.2 Initial Decision Maker, Definition of 1.1.8 Initial Decision Maker, Extent of Authority 14.2.2, 14.2.4, 15.1.3, 15.2.2, 15.2.3, 15.2.4, 15.2.5 Injury or Damage to Person or Property 3.18.1, 10.2.1, 10.2.2, 10.2.8, 10.3, 10.3.3, 10.4, 11.1.1 Inspections 3.1.3, 3.7.1, 4.2.2, 9.8.2, 9.9.2, 9.10.1, 13.5

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes

Instructions to Bidders 1.1.1 Instructions to the Contractor 3.1.4, 3.3.3, 3.7.1, 4.2.4, 5.2.1, 7, 8.2.2, 12.1, 13.5.2 Instruments of Service, Definition of 1.1.7, 1.5, 1.6 Insurance 6.1.1, 7.3.7, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, 11 **Insurance, Boiler and Machinery** 11.3.2 **Insurance, Contractor's Liability** 11.1 Insurance, Effective Date of 8.2.2, 11.1.2 Insurance, Loss of Use 11.3.3 Insurance, Owner's Liability 11.2 **Insurance**, **Property** 10.2.5, 11.3 Insurance, Stored Materials 9.3.2.11.3.1 **INSURANCE AND BONDS** 11 Insurance Companies, Consent to Partial Occupancy 9.9.1, 11.3.1.5 Insurance Companies, Settlement with 11.3.10 Intent of the Contract Documents 1.2, 4.2.18, 4.2.19, 7.4 Interest 9.7, 13.6 Interpretation 1.4, 4.2.8, 4.2.17, 4.2.18 Interpretations, Written 4.2.17, 4.2.18, 4.2.20 Joinder and Consolidation of Claims Required 15.4.4 Judgment on Final Award 15.4.2 Labor and Materials, Equipment 1.1.3, 1.1.6, 3.4, 3.8.2, 3.8.3, 3.12.2, 3.12.3, 3.12.6, 3.12.10, 3.13.1, 3.15.1, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.6, 9.10.2, 10.2.1.2, 11.3.1, 14.2.1, 14.2.2 Labor Disputes 8.3.1 Laws and Regulations 3.2.3, 3.2.4, 3.7, 3.13.1, 10.2.2, 10.2.3, 13.5.1, 14.2.1 Liens 2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8 Limitation on Consolidation or Joinder 15.4.4 Limitations, Statutes of 15.4.1 Limitations of Authority 3.12.4, 4.1.3, 4.2.16

Limitations of Liability 9.6.7.11.1.1.12.2 Limitations of Time 3.10.1, 4.2.17, 4.2.20, 8.2.1, 9.3.3, 9.6.1, 9.8.4, 9.10.2, 10.2, 11.1.3, 12.1.1, 12.2.2.2, 12.2.5, 13.7, 14.1.1, 15.2.6.1 Loss of Use Insurance 11.3.3 Material Suppliers 1.5.1, 1.5.2, 3.12, 4.2.6, 4.2.8, 9.3.1, 9.3.1.2, 9.3.3, 9.5.3, 9.6.4, 9.6.5, 9.6.7, 9.10.5, 11.3.1 Materials, Hazardous 10.2.4, 10.3 Materials, Labor, Equipment and 1.1.3, 1.1.6, 1.5.1, 1.5.2, 3.4, 3.5, 3.8.2, 3.8.3, 3.12.2, 3.12.3, 3.12.6, 3.12.10, 3.13.1, 5.2.1, 6.2.1, 9.3.1, 9.3.2, 9.3.3, 9.5.1, 9.5.3, 9.6.4, 9.6.5, 9.6.7, 9.10.2, 9.10.5, 10.2.1, 10.2.4, 10.3 Means, Methods, Techniques, Sequences and Procedures of Construction 3.3.1, 3.12.10, 4.2.5, 4.2.11 Mechanic's Lien 2.1.2, 15.2.8 Mediation 8.3.1, 10.3.5, 15.2.1, 15.2.5, 15.2.6, 15.3, 15.4.1 **Minor Changes in the Work** 1.1.1, 3.12.8, 4.2.13, 7.1, 7.4 **MISCELLANEOUS PROVISIONS** 13 Modifications, Definition of 1.1.1 Modifications to the Contract 1.1.1, 1.1.2, 3.11, 4.1.3, 4.2.14, 5.2.3, 7, 11.3.1 Mutual Responsibility 6.2 Nonconforming Work, Acceptance of 9.4.3, 9.8.3, 12.3 Nonconforming Work, Rejection and Correction of 2.3, 2.4, 3.2.3, 3.7.3, 9.4.3.3, 9.8.2, 9.8.3, 9.9.1. 11.1.1, 12.2.2.1, 12.2.3, 12.2.4, 12.2.5 Notice 1.5, 2.1.2, 2.2.1, 2.4, 3.2.4, 3.3.1, 3.7.1, 3.7.2, 3.7.5, 3.9.2, 3.12.9, 5.2.1, 6.3, 9.4.1, 9.7, 9.10.1, 9.10.2, 10.2.2, 10.2.6, 10.2.8, 10.3.2, 11.3.6, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1.2, 14.2.2, 14.4.2, 15.1.2, 15.1.4, 15.1.5.1, 15.2, 15.4.1 **Notice of Claims** 3.7.2, 10.2.8, 15.1.2, 15.4.1 Notice of Testing and Inspections 13.5.1, 13.5.2 Notices, Permits, Fees and 3.7, 7.3.7, 10.2.2 Observations, On-Site 3.2.1, 9.5.1, 12.1.1 Occupancy 2.2.2, 9.6.6, 9.9, 11.3.1.5 **On-Site Inspections** 4.2.2, 9.10.1, 9.4.4, 9.5.1

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

Orders, Written 4.2.7, 4.2.18, 4.2.20 Other Contracts and Contractors 1.1.4, 3.14.2, 4.2.9, 6, 11.3.7, 12.1.2 **OWNER** 2 Owner, Definition of 2.1.1 **Owner, Information and Services Required of the** 2.1.2, 2.2, 4.2, 6.1.2, 6.1.3, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.2, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1, 14.1.3, 15.1.3 Owner's Authority 1.5, 2.1.1, 2.3, 2.4, 3.4.2, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.8, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2, 7.3.1, 8.2.2, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.3.3, 11.3.10, 12.2.2.1, 12.3, 13.5.2, 14.2, 14.3.1, 14.4, 15.2.7 **Owner's Financial Capability** 2.2.1, 13.2.2, 14.1.1 **Owner's Liability Insurance** 11.2 Owner's Relationship with Subcontractors 1.1.2, 5.2.1, 5.3, 5.4.1, 9.6.4, 9.10.2, 14.2.2 **Owner's Right to Carry Out the Work** 2.4, 12.2.4, 14.2.2 **Owner's Right to Clean Up** 6.3 **Owner's Right to Perform Construction with Own** Forces and to Award Other Contracts 6.1 **Owner's Right to Stop the Work** 2.3 Owner's Right to Suspend the Work 14.3 Owner's Right to Terminate the Contract 14.2 **Ownership and Use of Drawings, Specifications** and Other Instruments of Service 1.1.1, 1.1.5, **1.5**, 1.6, 3.11, 3.12.10, 3.17, 4.2.14, 4.2.18, 4.2.20 **Partial Occupancy or Use** 9.9, 11.3.1.5 Patching, Cutting and 3.14, 6.2.5 Patents and Copyrights, Royalties 3.17 Payment, Applications for 4.2.1, 4.2.7, 4.2.15, 7.3.9, 9.2, 9.3, 9.4, 9.5, 9.7, 9.10.1, 9.10.3, 9.10.5, 11.1.3 Payment, Certificates for 4.2.15, 7.3.9, 9.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 15.1.3 Payment, Failure of 9.4.1, 9.5, 9.7, 14.1.1.3 Payment, Final 4.2.1, 9.8.2, 9.10, 11.1.2, 11.3.1, 11.3.5, 12.3, 15.2.1

Payment Bond, Performance Bond and 5.4.1, 7.3.7, 9.6.7, 9.10.2, 9.10.3, 11, 11.4 **Payments**, **Progress** 9.3.1, 9.4.2, 9.6 PAYMENTS AND COMPLETION 9.14 Payments to Subcontractors 5.4.2, 9.3, 9.5.1.3, 9.5.3, 9.6 2, 9.6.3, 9.6.4, 9.6.7, 9.10.5, 14.2.1.2 PCB 10.3.1 **Performance Bond and Payment Bond** 5.4.1, 7.3.7, 9.6.7, 9.10.2, 9.10.3, 11, 11.4 Permits, Fees, Notices and Compliance with Laws 2.2.2, **3.7**, 7.3.7.4, 10.2.2 PERSONS AND PROPERTY, PROTECTION OF 10 Polychlorinated Biphenyl 10.3.1 Product Data, Definition of 3.12.2 Product Data and Samples, Shop Drawings 3.11, 3.12, 4.2.9, 4.2.10, 4.2.14 **Progress and Completion** 8.2, 9.3.1, 9.4.2, 9.6, 9.8, 9.10, 14.2.4, 15.1.6 **Progress Payments** 9.3.1, 9.4.2, 9.6 Project, Definition of 1.1.4 **Project Representatives** 4.2.16 **Property Insurance** 10.2.5, 11.3 Project Schedule 3.10.1, 3.10.3, 3.10.4, 4.2.2, 4.2.3, 4.2.4 PROTECTION OF PERSONS AND PROPERTY 10 Regulations and Laws 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1, 15.2.8, 15.4 Rejection of Work 3.5, 4.2.8, 12.2.1 Releases of and Waivers and of Liens 9.10.2 Representations 1.3, 2.2.1, 3.5, 3.12, 6.2.2, 8.2.1, 9.3.3, 9.4.3, 9.5.1, 9.8.2, 9.10.1 Representatives 2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1 Requests for Information 4.2.20 Resolution of Claims and Disputes 15 Responsibility for Those Performing the Work 3.3.2, 3.7.3, 3.12.8, 3.18, 4.2.2, 4.2.5, 4.2.8, 5.3, 6.1.2, 6.2, 6.3, 9.5.1, 9.8.2, 10

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

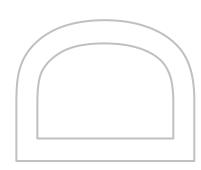
Retainage 9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3 **Review of Contract Documents and Field Conditions by Contractor** 1.2.2, 3.2, 3.7.3, 3.12.7 Review of Contractor's Submittals by Owner, Construction Manager and Architect 3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 5.2, 9.2, 9.8.2 Review of Shop Drawings, Product Data and Samples by Contractor 3.12.5 **Rights and Remedies** 1.1.2, 2.3, 2.4, 3.7.4, 3.15.2, 4.2.8, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, 13.4, 14, 15.4 **Royalties, Patents and Copyrights** 3.17 Rules and Notices for Arbitration 15.4 Safety of Persons and Property 10.2, 10.3, 10.4 **Safety Precautions and Programs** 3.3.1, 3.12, 4.2.5, 5.3, 10.1, 10.2, 10.3, 10.4 Samples, Definition of 3.12.3 Samples, Shop Drawings, Product Data and 3.11, 3.12, 4.2.9, 4.2.10 Samples at the Site, Documents and 3.11 **Schedule of Values** 9.2, 9.3.1 Schedules, Construction 3.10, 3.12.1, 3.12.2, 6.1.2, 15.1.5.2 Separate Contracts and Contractors 1.1.4, 3.12.5, 3.14.2, 4.2.6, 4.2.11, 6, 8.3.1, 12.1.2 Shop Drawings, Definition of 3.12.1 Shop Drawings, Product Data and Samples 3.11, 3.12, 4.2.9, 4.2.10, 4.2.14 Site, Use of 3.13, 6.1.1, 6.2.1 Site Inspections 3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2.2, 4.2.3, 4.2.15, 9.4.3.3, 9.8.3, 9.9.2, 9.10.1, 13.5 Site Visits, Architect's 3.7.4, 4.2.2, 4.2.15, 9.8.3, 9.9.2, 9.10.1, 13.5 Special Inspections and Testing 4.2.8, 12.2.1, 13.5 Specifications, Definition of 1.1.6 **Specifications** 1.1.1, 1.1.6, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14 Staffing Plan 4.2.3 Statute of Limitations 12.2.5, 13.7, 15.4.1.1 Stopping the Work 2.3, 9.7, 10.3, 14.1

Stored Materials 6.2.1, 9.3.2, 10.2.1.2, 10.2.4 Subcontractor, Definition of 5.1.1 SUBCONTRACTORS 5 Subcontractors, Work by 1.2.2, 3.3.2, 3.12.1, 4.2.5, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7 Subcontractual Relations 5.3, 5.4, 9.3.1.2, 9.6.2, 9.6.3, 9.10, 10.2.1, 14.1, 14.2 Submittals 3.2.3, 3.10, 3.11, 3.12, 4.2.9, 4.2.10, 4.2.11, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3 Submittal Schedule 3.10.2, 3.12.5, 4.2.9, 4.2.10 Subrogation, Waivers of 6.1.1, 11.3.7 **Substantial Completion** 8.1.1, 8.1.3, 8.2.3, 9.4.3.3, 9.8, 9.9.1, 9.10.3, 12.2.1, 12.2.2. 13.7 Substantial Completion, Definition of 9.8.1 Substitution of Subcontractors 5.2.3, 5.2.4 Substitution of Architect 4.1.4Substitution of Construction Manager 4.1.4Substitutions of Materials 3.4.2, 3.5, 7.3.8 Sub-subcontractor, Definition of 5.1.2 Subsurface Conditions 3.7.4 Successors and Assigns 13.2 **Superintendent 3.9**, 10.2.6 Supervision and Construction Procedures 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.3, 4.2.5, 4.2.8, 4.2.9, 4.2.10, 4.2.11, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.3.3, 10, 12, 14, 15.1.3 Surety 5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7 Surety, Consent of 9.10.2, 9.10.3 Surveys 1.1.7, 2.2.3 Suspension by the Owner for Convenience 14.3 Suspension of the Work 5.4.2, 14.3 Suspension or Termination of the Contract 5.4.1.1, 14 Taxes 3.6, 3.8.2.1, 7.3.7.4 Termination by the Contractor 14.1, 15.1.6

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

Termination by the Owner for Cause 5.4.1.1, 14.2, 15.1.6 Termination by the Owner for Convenience 14.4 Termination of the Contractor 14.2.2 **TERMINATION OR SUSPENSION OF THE** CONTRACT 14 **Tests and Inspections** 3.1.4, 3.3.3, 4.2.2, 4.2.6, 4.2.8, 9.4.3.3, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, 13.5 TIME 8 Time, Delays and Extensions of 3.2.4, 3.7.4, 5.2.3, 7.2, 7.3.1, 7.4, 8.3, 9.5.1, 10.3.2, 14.3.2, 15.1.5, 15.2.5 **Time Limits** 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.1, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.4.2, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.4, 12.2, 13.5, 13.7, 14, 15 **Time Limits on Claims** 3.7.4, 10.2.8, 13.7, 15.1.2 Title to Work 9.3.2, 9.3.3 **Transmission of Data in Digital Form** 1.6 UNCOVERING AND CORRECTION OF WORK 12 **Uncovering of Work** 12.1 Unforeseen Conditions, Concealed or Unknown 3.7.4, 8.3.1, 10.3 Unit Prices 7.3.3.2, 7.3.4 Use of Documents 1.1.1, 1.5, 2.2.5, 3.12.6, 5.3

Use of Site 3.13. 6.1.1. 6.2.1 Values, Schedule of 9.2, 9.3.1 Waiver of Claims by the Architect 13.4.2 Waiver of Claims by the Construction Manager 13.4.2 Waiver of Claims by the Contractor 9.10.5, 13.4.2, 15.1.6 Waiver of Claims by the Owner 9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6 Waiver of Consequential Damages 14.2.4. 15.1.6 Waiver of Liens 9.10.2, 9.10.4 Waivers of Subrogation 6.1.1, 11.3.7 Warranty 3.5, 4.2.15, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2 Weather Delays 15.1.5.2 Work, Definition of 1.1.3 Written Consent 1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.3, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 10.3.2, 11.4.1, 13.2, 13.4.2, 15.4.4.2 Written Interpretations 4.2.17, 4.2.18 Written Notice 2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 5.3, 5.4.1.1, 8.2.2, 9.4, 9.5.1, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 12.2.2, 12.2.4, 13.3, 13.5.2, 14, 15.4.1 Written Orders 1.1.1, 2.3, 3.9, 7, 8.2.2, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2



AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 10 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

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 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 the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their 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 other Multiple Prime Contractors and by the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 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 and certify termination of the Agreement under Section 14.2.2.

§ 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.

§ 1.2.2 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.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239) § 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. § 1.2.3.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

.1 Modifications, as defined in Section 1.1.1.

- .2 The Agreement.
- .3 Addenda, with those of later date having precedence over those of earlier date.
- .4 The General Conditions of the Contract for Construction.
- .5 Division 01 of the Specifications.
- .6 Drawings and remaining Divisions of the Specifications.

In the case of conflicts or discrepancies between Drawings and Divisions of the Specifications (other than Division 01), or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13.

§ 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and material or equipment 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 this Project is not to be construed as publication in derogation of the Architect, or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 Transmission of Data in Digital Form

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

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 Article 4, the Construction Manager and the Architect do 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.

AIA Document A232TM - 2009 (rev. 12/11) (formerly A201TMCMA - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 12 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 2.2 Information and Services Required of the Owner

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 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. Unless otherwise provided under the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit.

§ 2.2.3 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.

§ 2.2.4 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.

§ 2.2.5 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.

§ 2.2.6 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 2.3 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.

§ 2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 13 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

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 plural term "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

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

§ 3.1.4 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their 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 2.2.3, 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 Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and 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 Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and 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 make 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 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.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Construction Manager and Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.5.1 The Contractor may submit requests for information to the Architect to help facilitate the Contractor's performance of the contract. Prior to submitting each request for information, the Contractor shall first carefully study and compare the Contract Documents, field conditions, other Owner provided information, Contractor prepared Coordination Drawings, and prior Project correspondence and documentation to determine that the information to be requested is not reasonably obtainable from such sources.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 14 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 3.2.5.2 Each request for information shall be submitted to the Architect, in writing, with a copy to the Construction Manager. Each request for information shall identify the specific sources which were reviewed by the Contractor in an effort to determine the information requested, and a statement to the effect that the information being requested could not be determined from such sources.

§ 3.2.5.3 The Contractor shall submit each request for information sufficiently in advance of the date by which such information is requested in order to allow the Architect sufficient time, in the Architect's professional judgement, to permit adequate review and response and to permit Contractor compliance with the latest construction schedule.

§ 3.2.5.4 The Construction Manager shall maintain a log at the Project site that sequentially numbers and lists each request for information. This log shall contain the Drawings reference or Specification section to which the request pertains, the date of the request, to whom the request was made, by whom the request was made, the nature of the request, and the Architect's resolution thereof. This log shall be reviewed at each Project meeting and the status of the requests for information shall be made part of the minutes of such meetings.

§ 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, unless the Contract Documents give other specific instruction concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner, the Construction Manager, and the Architect and shall not proceed with that portion of the Work without further written instructions from the Architect, through the Construction Manager. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required 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 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 the Project 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 authorized by the Architect in accordance with Sections. 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, 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

The Contractor warrants to the Owner, Construction Manager, 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 with 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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 15 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. (1450395239) User Notes:

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 Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof 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.

The Owner is exempt from the payment of Federal, State, local taxes, and from payment of sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies sold to the Owner pursuant to the provisions of this Contract. These taxes are not to be included in bids. This exemption does not, however, apply to tools, machinery, equipment, or other property leased by, or to the Contractor or a subcontractor; and the Contractor and its subcontractor shall be responsible for, and pay, any and all applicable taxes, including sales and compensating use taxes.

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

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay 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, Construction Manager, and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, 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 an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, 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, Construction Manager, and Contractor in writing, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may proceed 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, Construction Manager, 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.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 16 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and .1 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.
- Contractors shall not include overhead and profit in base bid pricing. Contractors shall be entitled to 10% overhead and 5% profit (15% total) for approved and paid allowance amounts.

§ 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 furnish in writing to the Owner and Architect through the Construction Manager, the name and qualifications of a proposed superintendent. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager, or the Architect has reasonable objection to the proposed superintendent or (2) that any of them require additional time to review. Failure of the Construction Manager to reply 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, Construction Manager 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 Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information and the Construction Manager's approval a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project schedule to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Multiple Prime Contractors or the construction or operations of the Owner's own forces.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter update it as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a 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 participate with other Contractors, the Construction Manager and Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager and Architect and incorporated into the approved Project schedule.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 17 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 3.11 Documents and Samples at the Site

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These documents shall be available to the Architect and delivered to the Construction Manager 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 the way by which 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 and Construction Manager is subject to the limitations of Sections 4.2.9 through 4.2.11. Informational submittals upon which the Construction Manager and Architect are 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 Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Construction Manager Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the Project submittal schedule approved by the Construction Manager and Architect, or in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Multiple Prime Contractors or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples and similar submittals with related documents submitted by other Multiple Prime Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner, Construction Manager, 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 reviewed and 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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Construction Manager and Architect in writing 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 Construction Manager and Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

AIA Document A232TM - 2009 (rev. 12/11) (formerly A201TMCMA - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 18 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 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. 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 cause such services or certifications to be provided by a properly 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, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 Use of Site

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

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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's own forces or of other Multiple Prime Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner's own forces or by other Multiple Prime Contractors except with written consent of the Construction Manager, Owner and such other Multiple Prime Contractors; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the other Multiple Prime Contractors or the Owner the Contractor's 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 or 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, or Construction Manager with the Owner's approval, 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, Construction Manager and Architect 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, Construction Manager and Architect harmless from loss on account thereof, but shall not be responsible for such 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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 19 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

contained in Drawings, Specifications or other documents prepared by the Owner, Architect, or Construction Manager. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and 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 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 AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 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.

§ 4.1.2 The Owner shall retain a construction manager lawfully licensed to practice construction management or an entity lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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

§ 4.1.4 If the employment of the Construction Manager or Architect is terminated, the Owner shall employ a successor construction manager or architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and 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. 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 report to the Owner and Construction Manager (1) known deviations from the Contract Documents and from the most recent Project schedule prepared by the Construction Manager, and (2) defects and deficiencies observed in the Work.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 20 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 4.2.3 The Construction Manager shall provide a staffing plan to include one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner reasonably informed of the progress of the Work, and will report to the Owner and Architect (1) known deviations from the Contract Documents and the most recent Project schedule, and (2) defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Multiple Prime Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, or charge of, 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, except as provided in Section 3.3.1, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of or be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Construction Manager, and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Multiple Prime Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect if those communications are about matters arising out of or related to the Contract Documents. Communications by and with the Owner's own forces shall be through the Owner.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents and will notify each other about the rejection. The Construction Manager shall determine in general whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, upon written authorization of the Owner, whether or not such Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data and Samples. Where there are Multiple Prime Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from Contractor and other Multiple Prime Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.10 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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 21 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

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. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.11 Review of the Contractor's submittals by the Construction Manager and Architect 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 Construction Manager and 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 Construction Manager and Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Construction Manager and Architect, 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.

§ 4.2.12 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.13 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7. and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.14 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.15 The Construction Manager will assist the Architect in conducting inspections to determine the dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.16 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

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

§ 4.2.18 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 so rendered in good faith.

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

§ 4.2.20 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing to the Construction Manager to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 22 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

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 other Multiple Prime Contractors or subcontractors of other Multiple Prime Contractors.

§ 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager or the Architect has reasonable objection to any such proposed person or entity or, (2) that the Construction Manager, Architect or Owner requires additional time for review. Failure of the Construction Manager, Owner, or Architect to reply 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, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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 previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate agreement, written where legally required for validity, 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 responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager 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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 23 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

- assignment is effective only after termination of the Contract by the Owner for cause pursuant to .1 Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; 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 such 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 OTHER CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts § 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, which include persons or entities under separate contracts not administered by the Construction Manager, and to award other contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to

insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor 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's own forces, Construction Manager and other Multiple Prime 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's own forces or other Multiple Prime Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's own forces or other Multiple Prime Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a separate contractor or to other Multiple Prime Contractors 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 delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces or other Multiple Prime Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner, separate contractors, or other Multiple Prime Contractors as provided in Section 10.2.5.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 24 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 6.2.5 The Owner and other Multiple Prime Contractors 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, other Multiple Prime 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 Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

CHANGES IN THE WORK ARTICLE 7

§ 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, Construction Manager, Architect and Contractor; a Construction Change Directive requires agreement by the Owner, Construction Manager 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, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 The combined overhead and profit (for Contractor, subcontractors, suppliers, and contractors of a lower-tier) included in the total cost to the Owner for a change in the Work shall be as follows:

.1 Maximum combined overhead and profit, 15 percent of the cost.

.2 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.

.3 To facilitate checking of quotations for extras or credits, all proposals shall be accompanied be a complete itemization of costs including labor, materials, rental costs, and Subcontracts. Subcontracts shall be itemized also.

§ 7.2 Change Orders

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

- The change in the Work; .1
- .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 Construction Manager and signed by the Owner, Construction Manager 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:

- Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to .1 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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 25 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager and 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.

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the method and 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 Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers compensation insurance;
- Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or .2 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 related to the Work; and
- Additional costs of supervision and field office personnel directly attributable to the change. .5

§ 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 Construction Manager and 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 Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The 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 Construction Manager and 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 Construction Manager shall 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 has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order issued through the Construction Manager and shall be binding on the Owner and Contractor.

AIA Document A232TM - 2009 (rev. 12/11) (formerly A201TMCMA - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 26 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner, Owner's own forces, Construction Manager, Architect, any of the other Multiple Prime Contractors or an employee of any of them, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration, or by other causes that the Architect, based on the recommendation of the Construction Manager, determines may justify delay, then the Contract Time shall be extended by Change Order 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. The Owner shall not be liable to the Contractor and/or any subcontractor for claims or damages of any nature caused by or arising out of delays. The sole remedy against the Owner for delays shall be the allowance of additional time for completion of the Work, the amount of which shall be subject to the claims procedure set forth herein. Except to the extent, if any, expressly prohibited by law, the Contractor expressly agrees not to make and hereby waives any claim for damages for delay, including, but not limited to, those resulting from increased labor or material costs; directions given or not given by the Owner, Construction Manager or Architect, including scheduling and coordination of the Work; the Architect's preparation of drawings and specifications or review of shop drawings and requests for instruction(s); or, on account of any delay, obstruction or hindrance for any cause whatsoever by the Owner, Construction Manager, Architect, or any other contractor on the project, whether or not foreseeable or anticipated. The Contractor agrees that its sole right and remedy therefor shall be an extension of time, if appropriate. IT IS EMPHASIZED THAT NO MONETARY RECOVERY MAY BE OBTAINED BY THE CONTRACTOR FOR DELAY AGAINST THE OWNER, CONSTRUCTION MANAGER, OR ARCHITECT BASED ON ANY REASON AND THAT THE CONTRACTOR'S SOLE REMEDY, IF APPROPRIATE, IS ADDITIONAL TIME

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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.

§ 9.2 Schedule of Values

Where the Contract is based on a Stipulated Sum or Guaranteed Maximum Price, the Contractor shall submit to the Construction Manager, before the first Application for Payment, a schedule of values allocating the entire Contract

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 27 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. In the event there is one Contractor, the Construction Manager shall forward to the Architect the Contractor's schedule of values. If there are Multiple Prime Contractors responsible for performing different portions of the Project, the Construction Manager shall forward the Multiple Prime Contractors' schedules of values only if requested by the Architect.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner, Construction Manager or Architect may require, such as copies of requisitions from Subcontractors and material 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 Construction Manager and 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 material supplier unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments. At Substantial Completion, the Architect may authorize remaining partial payments to be made in full, less twice the value of items remaining to be completed and an amount necessary to satisfy any outstanding claims, liens, or judgements.

§ 9.3.1.4 Applications for Payment must be accompanied by any and all releases of liens for previous applications from Contractor and his/her subcontractors and a sworn and notarized statement that all subcontractors have been paid to at least 95% of previously requisitioned sums.

§ 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, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the The Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either issue to the Owner a Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 28 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 9.4.2 Where there are Multiple Prime Contractors performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives the Multiple Prime Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Multiple Prime Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Multiple Prime Contractors' application with information from similar applications for progress payments from other Multiple Prime Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Multiple Prime Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.3 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.4-2 The Construction Manager's certification of an -Application for Payment or, in the case of Multiple Prime Contractors, a Project Application and Certificate for Payment shall be based upon the Construction Manager's evaluation of the Work and the information provided as part of the Application for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information and belief, the Work has progressed to the point indicated and the quality of the Work is in accordance with the Contract Documents. The certification will also constitute a recommendation to the Architect and Owner that the Contractor be paid the amount certified.

§ 9.4.5-3 The Architect's issuance of a Certificate for Payment or in the case of Multiple Prime Contractors, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and information provided as part of the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated, that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified.

§ 9.4.64 The representations made pursuant to Sections 9.4.4 and 9.4.5 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 Construction Manager or Architect.

§ 9.4.7.5 The issuance of a separate Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material 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 Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.4 and 9.4.5 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.3. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 29 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- defective Work not remedied; .1
- third party claims filed or reasonable evidence indicating probable filing of such claims unless security .2 acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or 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 the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers 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 Construction Manager and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project 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 Construction Manager and 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 Construction Manager 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 Owner, Construction Manager and Architect 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 material and equipment 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 to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 30 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. (1450395239) User Notes:

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's 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 Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager 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 shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8-7 Substantial Completion

§ 9.87.1 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 the Owner can occupy or utilize the Work for its intended use.

§ 9.87.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly-prepare and submit to the Construction Manager and 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.

§ 9.87.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, 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 list, which is not sufficiently complete in accordance with the requirements of 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, assisted by the Construction Manager, to determine Substantial Completion.and no later than 14 days prior to the Contract-scheduled date of Substantial Completion, the Contractor shall issue a letter to the Architect (and MC0 confirming their work is ready for the Substantial Completion inspection. No later than seven days after Contract-scheduled date of Substantial Completion (including authorized adjustments), the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. Absence the contractor letter confirming readiness of work, the Architect may elect to postpone the substantial completion inspection. If the Architect's on-site observation discloses any item 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 Certificate of Substantial Completion, complete of correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another on-site observation by the Architect to determine the actual date of Substantial Completion.

§ 9.78.4 When the Architect, assisted by the Construction Manager, determines that the Work or designated portion thereof is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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.

.1 The Architect and Construction Manager will perform no more than one on-site observation to determine whether the Work or a designated portion thereof has attained both Substantial Completion and Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect and Construction Manager for any additional on-site observations.

§ 9.87.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 31 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. (1450395239) User Notes:

§ 9.7.6 In the event the Contractor does not achieve final completion within sixty (60) days after the date of substantial completion, allowing for any approved extensions of the contract time, Contractor shall not be entitled to any further payment and Contractor hereby agrees that such failure to complete the work within the time set forth above shall constitute a waiver of all claims by the Contractor to any money that may be due. This provision shall not operate as a waiver by the Owner of any claims or remedies of any nature against the Contractor arising out of the contract.

§ 9.9-8 Partial Occupancy or Use

§ 9.98.1 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 as required under Section 11.3.1.5 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 and Construction Manager shall jointly 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 after consultation with the Construction Manager.

§ 9.98.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, 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.

§ 9.98.3 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.

§ 9.10-9 Final Completion and Final Payment

§ 9.109.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager will evaluate the completion of Work of the Contractor and then forward the notice and Application, with the Construction Manager's recommendations, to the Architect who will promptly make such inspection. When the Architect, finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with terms and conditions of 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 Construction Manager's and Architect's final Certificate for Payment or Project 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.

§ 9.109.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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, and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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, and (6) all Project closeout documents per the General Requirements of the Contract. 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 32 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 9.409.3 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 Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed 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 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 through the Construction Manager 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.

- § 9.109.4 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; or
 - .3 terms of special warranties required by the Contract Documents.

§ 9.109.5 Acceptance of final payment by the Contractor, a Subcontractor or material 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. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 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

- employees on the Work and other persons who may be affected thereby; .1
- .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 or the Contractor's Subcontractors or Sub-subcontractors:
- .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: and
- .4 construction or operations by the Owner or other Contractors.

§ 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 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 owners and users of adjacent sites and utilities.

§ 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, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, 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

AIA Document A232^m - 2009 (rev. 12/11) (formerly A201^mCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 33 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4, except damage or loss attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any 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, Construction Manager 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, written notice of such 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

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner, Construction Manager and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify a 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, Construction Manager and Architeet the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resumed 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 in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their 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 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 34 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 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 indemnify 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 Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- Claims for damages because of bodily injury, sickness or disease, or death of any person other than the .3 Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- Claims for damages, other than to the Work itself, because of injury to or destruction of tangible .5 property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Construction Manager, the Construction Manager's consultants, the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 Owner's Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 35 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

§ 11.3 Property Insurance

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9,10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect's, Contractor's, and Construction Manager's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining 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

AIA Document A232^m - 2009 (rev. 12/11) (formerly A201^mCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 36 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. (1450395239) User Notes:

insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 Waivers of Subrogation. 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, and (2) the Construction Manager, Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, Owner's separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or distribution of insurance proceeds in accordance with the direction of the arbitrators.

§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 37 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

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 Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their observation 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 which the Construction Manager or Architect has not specifically requested to observe prior to its being covered, the Construction Manager or 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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or one of the other Contractors in which event the Owner shall be responsible for payment of such costs.

§ 12.2 Correction of Work

§ 12.2.1 Before or After Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 Construction Manager's and 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 an 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 written 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 2.4.

§ 12.2.2.2 The one-year period 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, whether completed or partially completed, of the Owner or separate contractors or other Multiple Prime Contractors 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.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 38 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 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 except that, 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 such 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 such assignment.

§ 13.3 Written Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity or to an officer of the corporation for which it was intended; or if delivered at or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 Rights and Remedies

§ 13.4.1 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.

§ 13.4.2 No action or failure to act by the Owner, Construction Manager, 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 in writing.

§ 13.5 Tests and Inspections

§ 13.5.1 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 Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Construction Manager, Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Construction Manager and 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 Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 39 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. (1450395239) User Notes:

such failure including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 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 Construction Manager for transmittal to the Architect.

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

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

§ 13.6 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

§ 13.7 Time Limits on Claims

The Owner and the Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 the Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

TERMINATION OR SUSPENSION OF THE CONTRACT ARTICLE 14

§ 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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be .1 stopped:
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Construction Manager has not certified or 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, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable .4 evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 40 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

days' written notice to the Owner, Construction Manager and 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful .3 orders of a public authority; or
- otherwise is guilty of substantial breach of a provision of the Contract Documents. .4

§ 14.2.2 When any of the above reasons exist, the Owner, after consultation with the Construction Manager, and upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- Exclude the Contractor from the site and take possession of all materials, equipment, tools, and .1 construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request .3 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 Construction Manager's and 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, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, 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 the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in 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 this 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 written 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
- except for Work directed to be performed prior to the effective date of termination stated in the notice, .3 terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 41 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

§ 15.1.2 Notice of Claims. Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Construction Manager and or Architect is not serving as the Initial Decision Maker. Claims by either party must 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.

§ 15.1.2.1 Written notice shall contain a heading stating "Notice of Claim" to clearly identify it as such. Such notice shall set forth in detail the circumstances that form the basis for the Claim and shall include the following

- .1 Clear statement of claim matter, including background and chronology.
- .2 Documentation in support of claim matter.
- .3 Documentation in support of claimed damages.
- 4 Certification by responsible officer of claimant.

§ 15.1.3 Continuing Contract Performance. 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. The Construction Manager will prepare Change Orders and the Architect will issue a Certificate for Payment or Project Certificate for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3.

§ 15.1.5 Claims for Additional Time

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

§ 15.1.6 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

- damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, .1 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.1.7 Claims by the Contractor must be made by written notice in accordance with the following procedures:

AIA Document A232TM - 2009 (rev. 12/11) (formerly A201TMCMA - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 42 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes: (1450395239)

.1 The Contractor may submit a claim concerning a matter properly noticed in accordance with the time requirements of this Contract.

.2 Failure by the Contractor to furnish the required claim documentation within the time set forth above shall constitute waiver of the Contractor's right to compensate for such claim.

.3 Contractor shall furnish three (3) certified copies of the required claim documentation, with a copy submitted to the Owner, Architect, and Construction Manager. The claim documentation shall be complete when furnished. The evaluation of the Contractor's claim will be based, among other things, upon the Owner project records and the Contractor's furnished claim documentation.

.4 Claim documentation shall conform to Generally Accepted Accounting Principles and shall be in the following format:

General Introduction 1.

General Background Discussion

Issues

- Index of Issues (listed numerically)
- For each issue b.
 - i. Background
 - ii. Chronology
 - iii. Contractor's position (reason for Owner's potential liability)
 - iv. Supporting documentation of merit or entitlement
 - v. Supporting documentation of damages
 - Begin each issue on a new page vi.
- 4. All critical path method schedules, (as-planned, monthly updates, schedule revisions, and as-built) along with the computer disks of all schedules related to the claim.
- Productivity exhibits (if appropriate)
- 6. Summary of Issues and Damages

.5 Supporting documentation of merit for each issue shall be cited by reference, photocopies, or explanation. Supporting documentation may include, but shall not be limited to, general conditions, general requirements; technical specifications; drawings; correspondence; conference notes; shop drawings and submittals; shop drawings logs; survey books; inspection reports; delivery schedules; test reports; daily reports; subcontracts; fragmentary CPM schedules or time impact analyses; photographs; technical reports; requests for information; field instructions; and all other related records necessary to support the Contractor's claim.

.6 Supporting documentation of damages for each issue shall be cited, photocopies, or explained. Supporting documentation may include, but shall not be limited to, any or all documents related to the preparation and submission of the bid; certified, detailed labor records including labor distribution reports; material and equipment procurement records; construction equipment ownership cost records or rental records; subcontractor or vendor files and cost records; service cost records; purchase orders; invoices; project as-planned and as-built cost records; general ledger records; variance reports; accounting adjustment records; and any other accounting materials necessary to support the Contractor's claim.

.7 Each copy of the claim documentation shall be certified be a responsible officer of the Contractor in accordance with the requirements of these Contract Documents.

§ 15.1.7.1 Claims and Actions Thereon. No claim against the Owner for damages for breach of contract or compensation for extra work shall be made or asserted in any action or proceeding at law, or in equity, unless the Contractor shall have strictly complied with all the requirements relating to the giving of notice and of information with respect to such claims all as provided in this Agreement.

§ 15.1.7.2 No Estoppel. Neither the Owner nor any department officer, agent or employees thereof, shall be bound, precluded or estopped by any determination, decision, approval, order, letter, payment or certificate made or given under or in connection with this Contract by the Owner, or any officer, agent or employee of the Owner, either before or after the final completion and acceptance of the Work and payment therefor: (1) from showing the true and correct classification, amount, quality or character of the Work actually done; or that any such termination, decision, order,

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 43 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019 and is not for resale. (1450395239) User Notes:

letter, payment or certificate was untrue, incorrect or improperly made in any particular matter, or that the Work or any part thereof does not in fact conform to the requirements of this Contract; or (2) from demanding and recovering from the Contractor any overpayments made to him, or such damages as it may sustain by reason of his failure to perform each and every part of this Contract in strict accordance with its terms; or (3) both (1) and (2) hereto.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such 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 and Construction Manager, if the Architect or Construction Manager 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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.

AIA Document A232TM - 2009 (rev. 12/11) (formerly A201TMCMA - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 44 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

§ 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 15.1.6 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 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. 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 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.

AIA Document A232^M - 2009 (rev. 12/11) (formerly A201^MCMa - 1992). Copyright © 1992 and 2009 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent 45 possible under the law. This draft was produced by AIA software at 15:08:15 ET on 03/20/2019 under Order No.7599116097 which expires on 06/12/2019, and is not for resale. User Notes:

| TO OWNER: | PKOJEC1: | PERIOD TO: PERIOD TO: PROJECT NOS.: | |
|---|--|--|--|
| FROM CONTRACTOR: | VIA ARCHITECT: | CONTRACT DATE: | |
| CONTRACT FOR: 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 | TION FOR PAYMENT 1 below, in connection with the Contract. is attached. | The undersigned Contractor certifies that to the best of the Contractor's knowledge, infor- mation 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 pay- ments received from the Owner, and that current payment shown herein is now due. CONTRACTOR: | or's knowledge, infor- t has been completed twe been paid by the were issued and pay- n herein is now due. |
| 2. Net change by Change Orders 3. CONTRACT SUM TO DATE (Line 1 ± 2) | 2)\$ | By: Date: | |
| DTAL CC olumn (ETAINAC | ATE | State of: County of: Subscribed and sworn to before me this day of | |
| b% of Stored Material (Column F on G703) Total Retainage (Line 5a + 5b or Total in Column I of G703) | | Notary Public: My Commission expires: | |
| 6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total) | \$9. | ARCHITECT'S CERTIFICATE FOR PAYMENT | ENT |
| 7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate) | 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 | rrvations and the data hat to the best of the ssed as indicated, the s, and the Contractor |
| 9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6) | TAINAGE | is entitled to payment of the AMOUNT CERTIFIED. AMOUNT CERTIFIED | |
| CHANGE ORDER SUMMARY AI Total changes approved in previous months by Owner | ADDITIONS DEDUCTIONS | (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: | t applied for. Initial that are changed to |
| Total approved this Month TOTALS | | By: Date: Date: Date: Date: This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Con- tractor named herein Issuance payment and acceptance of payment are without | able only to the Con- avment are without |
| NET CHANGES by Change Order | | prejudice to any rights of the Owner or Contractor under this Contract. | ontract. |

and a second second

رست. است المحمد الماريات

CAUTION: You should use an original AIA document which has this caution printed in red. An original assures that changes will not be obscured as may occur when documents are reproduced.

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

AIA Document G702 is a copyrighted work and may not be reproduced or excerpted from in substantial part without the express written permission of the AIA. The document is intended to be used as a consumable—that is, the original document purchased by the user is intended to be consumed in the course of being used. There is no implied permission to reproduce this document, nor does membership in The American Institute of Architects confer any further rights to reproduce G702. A limited license is hereby granted to retail purchasers to reproduce a maximum of ten copies of a completed or executed G702, but only for use in connection with a particular project. Further reproductions are prohibited without the express written permission of the AIA.

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.

| ORIGINAL CONTRACT SUM | s <u>l</u> i | 00,000.00 |
|---|-----------------------|------------------|
| . Net change by Change Orders | | 5,000.00 |
| ORIGINAL CONTRACT SUM Net change by Change Orders CONTRACT SUM TO DATE (Lind | e 1 ± 2) s_ [(| 25, <i>000.∞</i> |
| CONTRACT SUM TO DATE (Lind TOTAL COMPLETED & STORED (Column G on G703) |) TO DATE \$ | 40,000.00 |
| . RETAINAGE: a% of Completed Work (Columns D + E on G703) | 3000 | |
| b% of Stored Material (Column F on G703) Total Retainage (Line 5a + 5b or Total in Column L of G703) | • | |
| Total Retainage (Line 5a + 5b or Total in Column 1 of G703) TOTAL EARNED LESS RETAINA (Line 4 less Line 5 Total) | AGE | 6,500.00 |
| . LESS PREVIOUS CERTIFICATE: (Line 6 from prior Certificate) . CURRENT PAYMENT DUE | S FOR PAYMENT | 8,000,00 |
| . CURRENT PAYMENT DUE | | 8,500.00 |
| . BALANCE TO FINISH, INCLUDI (Line 3 less Line 6) | NG RETAINAGE | 00,00 |
| CHANGE ORDER SUMMARY | ADDITIONS | DEDUCTIONS |
| Total changes approved in previous months by Owner | | |
| T . 1 | 10,000,00 | F 000 00 |
| Total approved this Month TOTALS | 10,000,00 | 5,000,00 |

5,000.00

| mation and belief the V in accordance with th Contractor for Work fo | Work covered by this App e Contract Documents, or which previous Certif | lication for Pa that all amou icates for Payr | ttractor's knowledge, infor- yment has been completed nts have been paid by the ment were issued and pay- shown herein is now due. |
|--|--|---|--|
| By: KODERT | APPLE, PRESIC | DENT Dat | . AUGUENT 1, 1992 |
| State of: VIKGINI County of: PARTA Subscribed and sworn me this FIRST Notary Public: | to before | 1992 R 93 | |
| | | | YMENT |
| In accordance with the comprising this applic Architect's knowledge, quality of the Work is | Contract Documents, ba ation, the Architect certi information and belief t | ased on on-site fies to the Ow he Work has p Contract Docu | e observations and the data iner that to the best of the rogressed as indicated, the ments, and the Contractor |
| AMOUNT CERTIFIED | | <i>.</i> | . \$ |
| all figures on this Ap conform to the amount | plication and on the C | | nount applied for. Initial sheet that are changed to |
| ARCHITECT: | | | |

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

NET CHANGES by Change Order

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.

AIA Document G703TM – 1992. Copyright © 1963, 1965, 1966, 1967, 1970, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal RETAINAGE (IF VARIABLE RATE) BALANCE FINISH (C - G) ĥ H 1 V fra 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. **ARCHITECT'S PROJECT NO:** $(G \div C)$ % **APPLICATION DATE: APPLICATION NO:** ΰ AND STORED COMPLETED TO DATE (D+E+F)**PERIOD TO:** TOTAL MATERIALS PRESENTLY (NOT IN D OR E) STORED Ē THIS PERIOD **MALA** Document G703^{TI} – 1992 (II) WORK COMPLETED FROM PREVIOUS APPLICATION AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, (D + E)Ω Use Column I on Contracts where variable retainage for line items may apply. SCHEDULED In tabulations below, amounts are stated to the nearest dollar. VALUE C containing Contractor's signed certification is attached. DESCRIPTION OF WORK **Continuation Sheet** р ITEM NO. ∢

MAIA[®] 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 or a local AIA component to verify the most recent edition.

Reproductions. This document is a copyrighted work and may not be reproduced or excerpted from without the express written permission of the AIA. There is no implied permission to reproduce this document, nor does membership in The American Institute of Architects confer any further rights to reproduce this document. The AIA hereby grants the purchaser a limited license to reproduce a maximum of ten copies of a completed G703, but only for use in connection with a particular project. The AIA will not permit reproduction outside of the limited license for reproduction granted above, except upon written request and receipt of written permission from the AIA. Rights to reproduce the document may vary for users of AIA software. Licensed AIA software users should consult the End User License Agreement (EULA). To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

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 | В | с | D | Е | F | G | | Н | I |
|-------------|----------------------|--------------------|---|-------------|---|---|------------|------------------------------------|------------------------------------|
| | | | WORK CO | MPLETED | MATERIALS | TOTAL | | | |
| ITEM NO. | DESCRIPTION OF WORK | SCHEDULED VALUE | FROM PREVIOUS APPLICATION (D + E) | THIS PERIOD | PRESENTLY STORED (NOT IN D OR E) | COMPLETED AND STORED TO DATE (D+E+F) | % (G÷C) | BALANCE TO FINISH (C - G) | RETAINAGE (IF VARIABLE RATE) |
| 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 | 1 |

AIA Document G703TM – 1992. Copyright © 1963, 1965, 1966, 1967, 1970, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal coursel, copyright@aia.org.

| CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS AIA Document G706 (Instructions on reverse side) | OWNER ARCHITECT ARCHITECT CONTRACTOR SURETY OTHER |
|---|--|
| 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:



CAUTION: You should sign an original AIA document that has this caution printed in red. An original assures that changes will not be obscured as may occur when documents are reproduced. See Instruction Sheet for Limited License for Reproduction of this document.



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

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.

4. Limited License for Reproduction

AIA Document G706 is a copyrighted work and may not be reproduced or excerpted from in substantial part without the express written permission of the AIA. The G706 document is intended to be used as a consumable—that is, the original document purchased by the user is intended to be consumed in the course of being used. There is no implied permission to reproduce this document, nor does membership in The American Institute of Architects confer any further rights to reproduce G706.

A cautionary notice is printed in red on the original of this document. This notice distinguishes an original AIA document from copies and counterfeits. To ensure accuracy and uniformity of language, purchasers should use only an original AIA document or one that has been reproduced from an original under a special limited license from the AIA.

A limited license is hereby granted to retail purchasers to reproduce a maximum of ten copies of a completed or executed G⁻00, but only for use in connection with a particular project. Further reproductions are prohibited without the express permission of the AIA.

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 G^{*}06 form should be of the same (current) edition date as G^{*}06. 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 G⁻06, and should duly sign and seal this document containing the Contractor's signature. G⁻06 should be signed by the Contractor or the Contractor's authorized representative.

.

CONTRACTOR'S AFFIDAVIT OF
SELEASE OF LIENSOWNER
ARCHITECT
CONTRACTOR
SURETY
OTHERAIA Document G706ACONTRACTOR
SURETY
OTHERTO OWNER:
(Name and address)ARCHITECT'S PROJECT NO.:TO OWNER:
(Name and address)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:

CAUTION: You should sign an original AIA document that has this caution printed in red. An original assures that changes will not be obscured as may occur when documents are reproduced. See Instruction Sheet for Limited License for Reproduction of this document.

Π

 \square

FOR AIA DOCUMENT G706A, CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

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

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.

4. Limited License for Reproduction

AIA Document G706A is a copyrighted work and may not be reproduced or excerpted from in substantial part without the express written permission of the AIA. The G706A document is intended to be used as a consumable—that is, the original document purchased by the user is intended to be consumed in the course of being used. There is no implied permission to reproduce this document, nor does membership in The American Institute of Architects confer any further rights to reproduce G706A.

A cautionary notice is printed in red on the original of this document. This notice distinguishes an original AIA document from copies and counterfeits. To ensure accuracy and uniformity of language, purchasers should use only an original AIA document or one that has been reproduced from an original under a special limited license from the AIA.

A limited license is hereby granted to retail purchasers to reproduce a maximum of ten copies of a completed or executed G706A, but only for use in connection with a particular project. Further reproductions are prohibited without the express permission of the AIA.

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)

TO OWNER: (Name and address)

PROJECT: (Name and address)

OWNER ARCHITECT CONTRACTOR SURETY OTHER

ARCHITECT'S PROJECT NO .:

CONTRACT FOR:

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)

. SURETY,

on bond of (Insert name and address of Contractor)

, CONTRACTOR,

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)

, OWNER,

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.)

(Surety)

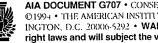
(Signature of authorized representative)

Attest: (Seal):



CAUTION: You should sign an original AIA document that has this caution printed in red. An original assures that changes will not be obscured as may occur when documents are reproduced. See Instruction Sheet for Limited License for Reproduction of this document.

(Printed name and title)



A. GENERAL INFORMATION

1. Purpose

This document is intended for use as a companion to AIA Document G706. Contractor's Affadavit 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

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.

4. Limited License for Reproduction

AfA Document G707 is a copyrighted work and may not be reproduced or excerpted from in substantial part without the express written permission of the AfA. The G707 document is intended to be used as a consumable—that is, the original document purchased by the user is intended to be consumed in the course of being used. There is no implied permission to reproduce this document, nor does membership in The American Institute of Architects confer any further rights to reproduce G707.

A cautionary notice is printed in red on the original of this document. This notice distinguishes an original AIA document from copies and counterfeits. To ensure accuracy and uniformity of language, purchasers should use only an original AIA document or one that has been reproduced from an original under a special limited license from the AIA.

A limited license is hereby granted to retail purchasers to reproduce a maximum of ten copies of a completed or executed G707, but only for use in connection with a particular project. Further reproductions are prohibited without the express permission of the AIA.

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.



AFT AIA Document A312 - 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

«To be determined-»«---» « »

OWNER:

(Name, legal status and address) «Thiells Roseville Fire District-»«-» «99 West Ramapo Road -» Garnerville, New York 10923

CONSTRUCTION CONTRACT

Date: « TBD » Amount: \$ « TBD » Description: (Name and location) «Miscellaneous Forms» « »

| BOND | | | |
|------------------|----------------------------|----------------------|---------------------------------------|
| Date: | | | |
| (Not earlier | than Construction Contra | ct Date) | |
| « <u>TBD</u> - » | | | |
| Amount: \$ « | (TBD » | | |
| Modification | ns to this Bond: « » | None «» | See Section |
| | - | _ | 18 |
| 001170407 | | | |
| CONTRACTO | OR AS PRINCIPAL | SURETY | |
| Company: | (Corporate Seal) | Company: | (Corporate |
| | | | Seal) |
| Signature: | « » | Signature: | « » |
| | | | |
| Name and | « »« » | Name and | « »« » |
| Title: | | Title: | |
| Any addition | al signatures appear on th | he last page of this | s Payment Bond.) |
| | | | . . |
| | MATION ONLY — Name, | - | · · · · · · · · · · · · · · · · · · · |
| | | | |

| AGENT of BROKER: | <i>OWNER'S REPRESENTATIVE:</i> (Architect, Engineer or other party:) |
|------------------|--|
| « » | « » |
| « » | « » |
| « » | « » |
| | « » |
| | « » |
| | « » |

SURETY:

(Name, legal status and principal place of business) «To be determined-»«----» « »

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.





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.

AIA Document A312 - 2010 Payment Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 14:46:49 ET on 12/31/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents[®] Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com. User Notes:

§ 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.

AIA Document A312 - 2010 Payment Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 14:46:49 ET on 12/31/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents[®] Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com. User Notes:

§ 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.

AIA Document A312 - 2010 Payment Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 14:46:49 ET on 12/31/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents[®] Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com. User Notes:

§ 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.

| « » (Space is provided below for additional signatures of added parties, other than those appearing on the cover page.) CONTRACTOR AS PRINCIPAL Company: (Corporate Seal) Signature: « » Name and Title: « » Address: « » Address: « » | | |
|--|---|--------|
| Company: (Corporate Seal) Company: (Corporate Seal) Signature: « » Signature: « » Name and Title: « »« » Name and Title: « »« » | CONTRACTOR AS PRINCIPAI SUBALUTES OF databases of addeed parties, other than those appearing on the cover | page.) |
| | Company: (Corporate Seal) Company: (Corporate | Seal) |
| | | |
| | | |
| | | |
| | | |
| | | |
| \bigcap | | |
| | \bigcirc | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

AIA Document A312 - 2010 Payment Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "AMerican Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 14:46:49 ET on 12/31/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com. User Notes:



AFT AIA Document A312 - 2010

SURETY:

« »

place of business)

«<u>To be determined</u> »« »

(Name, legal status and principal

Performance Bond

CONTRACTOR:

(Name, legal status and address)

« <u>To be determined</u> »« » « »

OWNER:

(Name, legal status and address) **«Thiells Roseville Fire District** 99 West Ramapo Road, Garnerville, New York, 10923 «→

CONSTRUCTION CONTRACT

| Date: « <u>TBD</u> -» |
|----------------------------------|
| Amount: \$ « <u>TBD</u> -» |
| Description: |
| (Name and location) |
| «New 26-100 Fire Headquarters -» |
| « <u>65 W Ramapo Road</u> -» |
| Garnerville, New York 10923 |

« »

« »

« »

| DOND | | | | |
|--|------------------|--------|-------------|---------------------------|
| Date: | | | | |
| (Not earlier « <u>TBD</u> » Amount: \$ « | than Constructio | on Con | tract Date) | |
| Modificatio | ns to this | «» | None | « » See Section 16 |
| Bond: | l | | | |
| CONTRACT | OR AS PRINCIPAI | | SURETY | |
| | (Corporate Sea | | Company: | (Corporate Seal) |
| Signature: | | | Signature: | |
| Name and | « »« » | | Name and | « »« » |
| Title: | | | Title: | |

(Any additional signatures appear on the last page of this Performance Bond.)

| (FOR INFORMATION ONLY - N | ame, address and telephone) |
|---------------------------|-----------------------------|
| AGENT or BROKER: | OWNER'S REPRESENTATIVE: |

(Architect, Engineer or other party:)

« » « » « » « » « » « »



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.





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.

AIA Document A312 - 2010 Performance Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:03:33 ET on 12/26/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, email docinfo@aiacontracts.com. (912420456) User Notes:

§ 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:

- After investigation, determine the amount for which it may be liable to the Owner and, as soon as .1 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.

AIA Document A312 - 2010 Performance Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:03:33 ET on 12/26/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, email docinfo@aiacontracts.com. (912420456) User Notes:

§ 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.

AIA Document A312 - 2010 Performance Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:03:33 ET on 12/26/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, email docinfo@aiacontracts.com. User Notes: (912420456)

§ 15 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.

§ 16 Modifications to this bond are as follows:

| nace is provided | helow for addit | ional signatures of add | ed parties other than | those appearing on the cover page |
|-----------------------------|-----------------|-------------------------|-----------------------------|-----------------------------------|
| CONTRACTOR AS PRINCIPAL | | | SURETY | |
| Company: | | (Corporate Seal) | Company: | (Corporate Seal) |
| Signature: | | | Signature: | |
| Name and Title: Address: | « »« » « » | | Name and Title: Address: | « »« » « » |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

AIA Document A312 - 2010 Performance Bond. Copyright © 2010. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:03:33 ET on 12/26/2024 under Order No.3104238766 which expires on 02/28/2025, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com. User Notes: (912420456)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Division 0 & 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Project Locations: 65 W Ramapo Road
- B. Owner: Thiells-Roseville Fire District, 99 US-202, Thiells, NY 10984
- C. Architect Identification: H2M architects + engineers, 538 Broadhollow Road Melville, NY 11747
 1. Representatives:
 - a. David B Sherland AIA, Senior Project Architect.
 - 1) <u>dsherland@h2m.com</u>
 - 2) 631-393-4939
 - b. Rachael Grodzki, RA, Project Architect
 - 1) <u>Rgrodzki@h2m.com</u>
 - 2) 631-392-5617
- D. Construction Manager: The Palombo Group, 22 Noxon Street, Poughkeepsie, NY 12601
 - 1. Construction Manager Representative: Luis Rodriguez, President.
 - 2. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to aid in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager.
- E. Project Identification: New 26-100 Fire Headquarters
- 1.03 SUMMARY OF WORK LIST OF CONTRACTS
 - A. The work will be constructed under multiple prime contracts. One set of contract documents is issued covering multiple contracts. Each Prime Contract/Contractor is defined as:
 - 1. CONTRACT G: GENERAL CONSTRUCTION WORK CONTRACT
 - a. Also referred to as: "General Contractor" or "GC"
 - b. CONTRACT M: MECHANICAL CONSTRUCTION WORK CONTRACT
 - 1) Also referred to as: "Mechanical Contractor" or "MC"
 - c. CONTRACT E: ELECTRICAL CONSTRUCTION WORK CONTRACT
 - 1) Also referred to as: "Electrical Contractor" or "EC"
 - d. CONTRACT P: PLUMBING CONSTRUCTION WORK CONTRACT
 - 1) Also referred to as: "Plumbing Contractor" or "PC"
 - e. CONTRACT C: SITE CONSTRUCTION WORK CONTRACT
 - 1) Also referred to as: "Site Contractor", "Civil Contractor", "SC", or "Contractor responsible for Site Work"
- 1.04 GENERAL REQUIREMENTS FOR WORK UNDER SEPARATE CONTRACTS TO BE INCLUDED IN EACH CONTRACT:
 - A. GENERAL REQUIREMENTS
 - 1. The project will be constructed under a multiple-prime contracting arrangement with the Owner awarding and holding separate Contracts. Each contractor shall furnish all labor, material, tools, equipment, access equipment, supervision, layout, delivery, trucking, material handling equipment, shop drawings, submittals, coordination, etc. necessary to complete the work described in the Division of Work of their respective Contracts and based upon a complete set of Contract Documents.

- 2. One set of documents is issued covering all multiple contracts. Each contractor is to review all drawings and specifications for complete understanding and knowledge of the work.
- 3. The following Contract Documents are specifically included and defined as integral to each Contract.
 - a. Bidding Requirements
 - b. Performance and Payment Bonds
 - c. Conditions of the Contract, including
 - 1) General Conditions.
 - 2) Insurance Requirements.
 - 3) NYS Prevailing Wage Rates.
- 4. Unless otherwise indicated, the Work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
- 5. All Contractors are responsible for reviewing Drawings and Specifications as they pertain to their scope of work mentioned in the contract documents. Scopes of work referenced may be found in multiple locations throughout the Drawings and Specifications. Each Contractor is responsible to review all Drawings and Specifications for every contract to gain a complete understanding and knowledge of the entire project, to determine how the work of each contract is to interface with every other contract.
- 6. Each Contractor must self-perform a minimum of 25% of their scope of work. This value is to be verified based on aggregate value of each Subcontractor's subcontract value and will be verified prior to the contract award and monitored throughout the project.
- 7. Local customs and trade union jurisdictional settlements do not control the scope of work included in each prime contract.
- 8. Each Contractor has been given the opportunity prior to bid to inspect the entire Project site for interferences to their Contract work and agrees to accept the site as it exists on the date of the bid opening.
- 9. Each Contractor shall submit a proposed subcontractors list at the start of the Project with any additional subcontractor qualification documents as required per Specifications. An updated copy of the Subcontractor list is to be attached with each Application for Payment which includes Subcontractor contract amounts and payment status information. The Contractor and all subcontractors are required to register with New York State Department of Labor (DOL). Submit updated Subcontractor DOL Registration Documents with updated Contractor Subcontractor and Supplier Lists.

B. SCHEDULE

- 1. See Project Milestone Schedule.
- Contractor Construction Project Schedule: Each Contractor is required to engage a qualified CPM Construction Scheduling Service to generate (or provide equivalent self-performed scheduling services with Construction Manager approval) and submit a construction schedule based on the dates of the Contract Milestone Schedule. See Construction Progress Documentation / Schedule Specifications for additional requirements.
 - a. Each Contractor's construction schedule is to be submitted for review and comment no later than 3 weeks after a Notice to Proceed for the work is issued.
 - b. Contractor Project Schedules are to be assembled in compliance with the Contract Milestone Schedule.
 - c. For the initial Construction Project Schedule, the Project Milestone Schedule is to be used as a basis for predecessor activities.
 - d. If there is schedule information pending from other Contractors to schedule an activity on the schedule, the Contractor shall indicate on the schedule the duration and sequence of the activity and further indicate the item as pending by others.
 - e. Include notes regarding activities that may impact other Contractor's activities.

- f. Each Contractor has the responsibility to respond to questions from other Contractors with regards to the sequence and completion dates/durations of activities.
- g. A copy of the updated Project Schedule is to be included with each Application for Payment.
- h. Multiple Crews: To maintain the project schedule, each Contractor is to provide multiple crews. Each crew is to be furnished with its own supervision, equipment, and other means necessary to maintain the Project Schedule.
- 3. Master Construction Schedule: The General Contractor is required to review all Construction Schedules submitted by the other Contractors and entities performing work on the Project and combine into a complete Master construction schedule that has been coordinated with all other work on the Project. To be submitted no later than 2 weeks after all other Contractors have submitted their respective Construction Schedules.
 - a. If the Critical Path of the projected Substantial Completion exceeds the Substantial Completion date of the Milestone Schedule or other dates listed in the Milestone Schedule, then the contractor designated as the entity responsible for producing the master schedule is to identify the critical path items and notify the Construction Manager. If the conflict cannot be resolved, then a meeting is to be scheduled between each Contractor to review the resolution options which may require Contractors to provide additional Crews/Manpower.
- 4. 2 Week Look Ahead Schedule: Each Contractor will be required to submit a detailed 2 week look ahead schedule that indicates which activities are scheduled each day for all periods each contractor is performing any amount of work.
- 5. Submittal Schedule: Each Contractor is required to review all Project Specifications and provide a list of all submittals and closeout documents expected to be submitted for the Project to be reviewed by the Architect/Construction Manager.
 - a. Submittal Schedule to be submitted on form specified by the Project or as directed by Construction Manager.
 - b. Submittal Schedule items to be broken down into a list by individual submittal document. All expected individual closeout submittals to also be included in the Submittal Schedule prior to approval. Closeout Submittals may include but are not limited to: Operation and Maintenance Data, Record Documents, Warranties, Start Up and Test Reports, Training Documentation, Material Transmittals.
 - c. Submittals to be grouped into the following types: Product Data, Shop Drawings, Samples/Mockups, and Closeout Documents: Maintenance Data, Record Drawings/Specifications, Warranties, Test Reports, Training Agenda's, Training Sign in Sheets, Maintenance Materials; and type "other".
- 6. Available Working Hours: All contract scopes of work in unoccupied areas of work are to be performed weekdays from 7:00 AM to 3:30 PM unless otherwise noted. Work cannot be performed in occupied areas. Work shall be scheduled off-hours, vacations, and weekends for occupied areas. A Construction Manager Superintendent must be always onsite when any work is being performed.
 - a. If a contractor fails to maintain the progress as indicated by the milestone schedule by no other fault but its own, or requires extended working hours for their own convenience outside of the scheduled Contract Working hours and requires overtime to complete the work; the contractor shall make arrangements with the Construction Manager 48 hours in advance and pay for a Construction Manager's superintendent at \$125.00 per hour via deduct change order. If the cause for delay is multi-contract, then the costs shall be distributed evenly among contracts. Advise the Construction Manager 48 hours prior to commencing work inside the building.
- 7. When work is scheduled for second shift or off hours and occupied by the owner during the day; work areas and finishes must be restored back to original finished conditions at the end of each day for occupancy the following day.
- 8. Coordination of any utility and/or power interruption must be done with the Construction Manager. Shutdowns must occur during off-hours and on days as directed by the owner. Contractor overtime costs for off hours work to be included in Base Bid.

- 9. Schedule operations to avoid conflicts or interruptions to Owner's building operation as directed by the Construction Manager. Coordinate interruptions with the Construction Manager.
- 10. Owner's Right to Cure: Project Schedules, Master Schedules, or Submittal Schedules: If the Contractor fails to provide a detailed Project Schedule, Master Schedule, or Submittal Schedule within 14 days upon request by the Construction Manager or by date required on Project Milestone Schedule, then the Owner retains the right to hire outside services to:
 - a. Review the work of the Contract Documents and coordinate with other Contractors to generate a detailed Project Schedule or Master Schedule to perform all activities needed to complete the work of their respective Contract and comply with the Date of Substantial Completion.
 - b. Review the Contract Specifications and generate Submittal Schedule including the project specific list of expected Preconstruction Submittal and Closeout Submittal items.
 - c. Deduct costs from the Contractor who has failed to provide these contractual required administrative services.
 - d. If the Construction Manager must perform these services on behalf of the Contractor to produce either Contractor Project Schedules, Master Schedules, or Submittal Schedules after the Contractor has failed to provide as required after notification and allotted time, then the Contractor will be responsible to bear the Construction Manager's administrative costs at a rate of \$125.00 per hour via deduct change order to provide these administrative services on behalf of the contractor.
- C. SUPERVISION
 - 1. Each Contractor shall designate a full-time Field Superintendent to supervise the work of their own contract, who shall always be present on the job site when work is being performed; this person shall be familiar with Project and authorized to conclude matters relating to progress. In addition, each Contractor shall designate a single Project Manager to oversee all aspects of the Project.
 - 2. The proposed Field Superintendent and Project Manager for the project is to have at least five years of experience in the proposed position.
 - a. Each Contractor shall submit resumes to the Construction Manager for the proposed Project Manager and Field Superintendent for the project. This information will be reviewed with the Owner, Architect and Construction Manager for approval.
 - b. Should the Project Managers or Superintendent prove to be unqualified for the position at any point in the project, the Construction Manager shall issue a letter stating that the person is to be removed from involvement in the project. Action by the contractor must be made within seven working days of receipt of such letter.
 - c. The Field Superintendent shall participate in providing scheduling information, Two Week Look Ahead Schedules, field coordination of layout when required, and provide quality control procedures of all work performed under the contract.
 - d. For Contracts #1 (G) and #5 (C), provide a dedicated non-working non-trade supervisor to act as the Field Superintendent to supervise all work scheduled onsite. A working foreman is not sufficient to fulfill the role of the Field Superintendent.
 - 3. Each Prime contractor shall maintain within its field office a complete and current set of Contract Documents (including any Addenda, Change Orders, and Modifications thereto), Contract Record Drawings, approved shop drawings, samples, color schedules and other data pertinent to the Project.
 - 4. Each Prime Contractor is to assemble an Employee List of all employees for all self-performed and subcontracted work and provide copies of OSHA cards for all employees on the Employee List.
 - 5. Update the Employee List to add new employees which have been added to the project and include a copy of the employee list with each Application for Payment. Employee list with OSHA Cards to cross reference with the submitted Certified Payroll with each Application for Payment.

- a. When criminal background checks are specifically required on a Project, provide copies of Driver Licenses for Employee for background check purposes.
- 6. Any person in the Contractor's organization who conducts themselves in a manner that violates safety protocols, demonstrates insufficient professional/personal conduct, or behaviors deemed problematic or unprofessional on the Project can be directed to be removed immediately and permanently from the Project site by the Construction Manager or Owner.

D. COORDINATION BETWEEN PRIME CONTRACTS

- 1. Provide all Coordination responsibilities as indicated in COORDINATION Specification 013115.
- 2. Coordination Drawings in New Construction: Each Contractor is required to engage a qualified drafting agency capable of producing coordination drawings and models utilizing various industry standards and file formats including but not limited to: (Revit, AutoCAD, etc.).
- 3. The Mechanical Contractor will take on the additional responsibility of overseeing the coordination modeling/drawing process and provide additional clash detection reports of all models by other Contractors using the BIM Modeling Software for New Construction Building Work. The Mechanical Contractor is to communicate any issues that arise from other Contractors not fulfilling their obligations to the Construction Manager.
- 4. The Construction Manager will provide direction and communications between each Contractor and schedule coordination meetings as required.
- 5. For ALL Construction: Each Contractor that requires preceding support work by others such as: openings, penetrations, structural support, utility trench layout, equipment pads, and any other work needed by a following Contractor, the subsequent Contractor is required to provide a field mark out of their work for any other Contractors who are to provide the preceding support work for the subsequent Contractor. Each Contractor is to provide personnel onsite to supervise the installation of the preceding support work as required. Layout to be based off the approved Shop Drawings generated from the Multi-Contractor Approved Coordination Model/Drawings.
 - a. Any roof openings or steel support required to be installed shall be marked out on the underside of the Roof Deck and on the Roof Exterior Surface by the contractor installing the items requiring the openings and support for the work of their own contract.
- 6. Access doors not shown on Architectural drawings and required for access to concealed systems for maintenance, access, or code requirements (valves, dampers, junction boxes) for the Work of each contract shall be furnished by each contract for its own Work to the General Contractor for installation in new wall, floor, or ceiling: construction. All access doors shall comply with Division 8 Section "Access Doors and Frames."
- E. OPENINGS, PENETRATIONS, EXISTING CEILINGS, PATCH TO MATCH RESTORATION, AND EMBEDDED ITEMS
 - 1. In New Construction (New: walls, partitions, floors, ceilings, and roofs):
 - a. The General Contractor is required to review all Contract Drawings for all other Contractors to identify generally where Openings, Sleeves, Embedded items, or Roof items will be required for ductwork, piping, and electrical/low voltage devices as depicted on all other Contract Drawings. Insulation thickness of the penetrating/opening item is to be considered for sizing of openings.
 - b. Notification of scheduling of new Wall, Floor, or Ceiling Construction is to be sent by the General Contractor at least 7 days prior to construction. Field Layout, Shop Drawings, Written Documentation, and onsite personnel are to be provided by the respective Contractor that requires the opening or sleeve during the new wall, floor, or ceiling construction. The General Contractor is to provide field layout of internal structural reinforcement to avoid conflict with new penetrations.
 - 1) If the General Contractor does not notify the Construction Manager and contractors associated with new work, sleeves or openings of new wall or floor

construction at least 7 days prior, then the GC is to provide the work needed to install these openings/penetrations once identified as missing. Submission of a Two-Week Schedule with specific locations sent directly to all Contractors and Construction Manager is sufficient for notification.

- 2) If Layout information and has not been provided to the General Contractor prior to scheduled installation of new wall/partition/floor (with 7-day notice), then the contractor that failed to provide the layout will be responsible for providing the new opening with any lintel, sleeve, or reinforcement required after the new wall or floor has been constructed.
- c. For new Masonry Walls, Concrete Walls, or Concrete floors:
 - Openings: The General Contractor will provide all lintels, rebar, and other reinforcement for all through and recessed openings (rectangular, or as needed for round openings larger than 8" diameter) for all other contractors for work depicted on all other contract drawings associated with other contractors. Each Contractor is to provide sealing/fireproofing of these openings.
 - 2) Penetration Round Sleeves: Each respective Contractor will furnish their own sleeves (when penetration is larger than 1-1/4") for their own work and turn them over to the General Contractor for installation.
 - 3) Round Openings larger than 8" Diameter in Masonry Walls will be considered an Opening with reinforcement to be provided by General Contractor. Each respective Contractor requiring openings for round penetrations larger than 8" is still required to provide a sleeve for patching, firestopping, and sealing purposes.
 - 4) Floor sleeves to be provided at sufficient height for "Water Dam".
 - 5) Penetrations 1-1/4" or less shall be provided and installed by each respective contractor requiring penetration.
 - 6) Each Contractor is to provide field layout of the installation location for their own sleeves.
 - 7) Each Contractor is to provide sealing/fireproofing of penetrations and openings associated with their work. Escutcheons to be provided for all pipe penetrations in visible areas as needed.
 - 8) Embedded Piping, Conduits, and back boxes: Each respective Contractor requiring piping, conduits, device back boxes in walls or floors shall have manpower onsite during scheduled installation of new masonry walls, or concrete form assembly to install conduits, piping, and back boxes as required. Each Contractor is to provide sealing/fireproofing of penetrations and back boxes associated with their work.
 - 9) For new Stud Frame; Partitions, Walls, and Ceilings:
 - (a) Openings: The General Contractor will provide all stud wall reinforcement for all through and recessed openings for all other contractors for work depicted on all other contract drawings associated with other contractors. Each Contractor is to provide sealing/fireproofing of these openings.
 - (b) Penetration Round Sleeves: Each respective Contractor will furnish and install sleeves for their own work. Each Contractor is to provide field layout of the installation location for their own sleeves. Each Contractor is to provide sealing/fireproofing of penetrations associated with their work. Escutcheons to be provided for all pipe penetrations in visible areas as needed.
 - (c) Embedded Piping, Conduits, and back boxes: Each respective Contractor requiring piping, conduits, and device backboxes in walls, floors or ceilings shall have manpower onsite during scheduled installation of new stud framing assembly to install conduits, piping, and back boxes as required. Each Contractor is to provide sealing/fireproofing of penetrations and back boxes associated with their work.
 - 10) For embedded items in new floors and flooring finishes:
 - (a) The General Contractor shall provide field layout of finished floor elevations.

- (b) Each Respective Contractor shall install any items to be embedded in the floor (with all parts, accessories, or covers at the correct elevation required.
- (c) Each respective Contractor shall provide product data/shop drawings of the embedded items to the General Contractor and have all parts, accessories, or covers of the embed items onsite for review and coordination.
- (d) The General Contractor and the respective contractor installing the embedded items shall review together the elevations of the installed embedded items and check prior to floor install if all embed items are at the correct heights.
- (e) If the elevation of an embedded item is not at the correct height, then the General Contractor shall not proceed with floor installation and instead notify the Construction Manager and associated contractor of the discrepancy and provide the associated contractor the opportunity to correct.
- (f) Written Documentation of the embedded item height verification shall be recorded by each contractor and submitted to the Construction Manager prior to floor installation for finish floors, subfloors, or concrete slabs.
- d. For Roof Construction:
 - (General Contractor shall provide responsibilities of Roofing Contractor for locations where the General Contractor is responsible to provide Roof Work).
 - 2) All blocking, flashing, and cutting of roof material/decking and installation is by the Roofing Contractor.
 - Structural Steel Support framing for all roof openings, roof penetrations, roof drains and roof equipment is to be furnished and installed General Contractor, review all contract drawings for all roof opening or equipment locations.
 - 4) All Roof Curbs, Equipment Curbs, Duct curbs, roof drains, and pipe portals are to be furnished by each respective contractor associated with the new work and installed by the Roofing Contractor. Roof curbs to be placed on roof by the contractor furnishing the curb. Once curb/opening is installed, the Roofing Contractor is to provide temporary weathertightness of curb with plywood until new equipment/work is installed. Pipe boots for plumbing vents to be provided by Roofing Contractor.
 - 5) Referenced Roof or Structural Work noted above shall be marked out on the underside of the Roof Deck and on the Roof Exterior Surface via Field Layout. Field Layout to be provided by each respective Contractor requiring the Roof or Structural Work to support the work of their own Contract.
- e. Firestopping and penetration sealing for the Work of each contract shall be provided by each contractor for its own Work for all penetrations and openings. Firestopping shall comply with Division 7 Sections "Through-Penetration Firestop Systems". Products are to be submitted to the Architect for Approval.
 - 1) Each contractor is to provide acoustic sealants for all their respective penetrations, openings, and back boxes for items that do not require firestopping.
- f. Each contractor shall return areas disturbed by their work activities to condition prior to start of work as initially documented by Contractor.

F. CONCRETE PADS AND BASES FOR EQUIPMENT

- 1. Concrete for the Work of each contract shall be provided by each Contractor as needed for completion of their own Work, unless specifically assigned to another Contract.
 - a. Concrete Equipment Pads and Bases specifically shown to be provided on the Architectural or Structural Drawings are to be provided by the General Contractor, and if specifically shown to be provided on the Civil Drawings, then those pads or bases are to be provided by the Contractor responsible for providing the Site Work or Site Contractor.
 - b. All other pads or bases are to be provided by the contractor providing the equipment associated with the concrete pad or base.

G. TRENCHES, EXCAVATION, BACKFILL, AND INFILL FOR UTILITIES

- 1. Utility Trench Excavation is considered: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all Contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
 - a. Utility Trench Excavation shall be provided as assigned per "Scope Delineation Areas" below:
 - For New Construction under new floors and within new building perimeter + 5-Foot Zone from foundation perimeter: The General Contractor shall provide: Utility Trench Excavation for the underground work of all contracts as shown on all drawings.
 - For New Construction outside of the 5-Foot Zone from the new building foundation perimeter: The Contractor responsible for Site Work shall provide: Utility Trench Excavation for the underground work of all contracts as shown on all contract drawings.
 - b. Utility Trench Excavation is to be provided for (but not limited to) the following utilities:
 - 1) All underground Electrical, Telecommunications, Data, and Fiber utilities and conduits shown on Electrical, Civil, or Telecommunications Drawings.
 - 2) Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
 - 3) Floor boxes and associated conduits indicated on Electrical Drawings.
 - 4) Water Line or Water Service Piping indicated on Plumbing or Civil Drawings.
 - 5) Sanitary and Sewer Piping indicated on Plumbing or Civil Drawings.
 - 6) Sprinkler Piping indicated on Fire Protection or Civil Drawings
 - 7) Drainage Piping indicated on Plumbing or Civil Drawings.
 - 8) Geothermal Piping indicated on Mechanical or Civil Drawings.
 - 9) Gas Piping indicated on Plumbing or Civil Drawings. (Exclude Utility Trench Excavation for Gas Utilities provided by Owner's Gas Utility Company.)

H. SAFETY

- 1. Provide OSHA 10-hour training certificate for all employees prior to starting work on the site. In addition, these certificates must be sent in with certified payroll as new employees are hired in accordance with NYS DOL.
- 2. Contractor to provide potable cooled drinking water for its own employees.
- 3. Contractor to provide: Secure lockup of its own tools, materials, and equipment. Provide temporary enclosures/storage containers of materials as needed.
- 4. Contractor to provide: Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
- 5. All OSHA Safety, NYS Department of Labor, and Hazardous Materials Regulations will be enforced on this project. All Contractors must submit a site-specific safety plan, a hazardous materials program, (all required data must be maintained at the job site), designate contractor safety supervisor, and attend safety meetings.
 - a. Safety Meetings with Toolbox Talks will be required from each contractor weekly.
 - b. Each contractor to maintain on site Material Safety Data Sheets (MSDS) for all materials utilized on site.
 - c. All personnel working on site shall always wear personnel protective equipment as required. All construction personnel are required to wear high visibility vests and visible identification when onsite. Hard Hats are required to be worn per OSHA requirements.
 - 1) Those without identification will be removed from the site at once. If the same individual fails to wear the identification a second time they will be removed and not be allowed back on site.

- d. Provide material lifting equipment and licensed operators required for the completion of Contract requirements, and complying with NYS Labor Laws, OSHA requirements, and other Federal, State, and local laws. All lifting operations (i.e. rigging of rooftop equipment) will require a written lift plan and operator licenses to be submitted for record 2 weeks in advance of scheduled lift date.
- e. Provide Fire Prevention materials and equipment for fire protection related to the work of their own Contract. Provide fire extinguishers, fire blankets, and fire watch supervision during all "Hot Work" operations and as required by OSHA requirements.
- f. Each Contractor is responsible for cabling or roping off all roof openings created from their own work in an OSHA approved manner. Provide all necessary fall protection.
- g. If another Contractor discovers building or site conditions do not meet OSHA requirements, then that Contractor must notify the Construction Manager and is to not proceed without having the condition corrected to meet OSHA requirements.
- h. Each Contractor is to provide safety protections for conditions created by the installation of their own work as per OSHA Guidelines.

I. SITE ACCESS AND MATERIAL STORAGE:

- 1. Each Contractor shall be onsite to receive their own material deliveries, store onsite, and protect until the material is ready to be installed in the final locations. Do not deliver materials directly to the Owner for receipt without acceptance of material approved by the Architect.
 - a. Additional costs for double handling will not be allowed. Provide secure lock up of materials and provide protection as needed.
 - b. Store all materials in conditions that are in accordance with manufacturers recommendations and requirements.
 - c. Provide Storage Containers as needed for materials, tools, and equipment delivered to the Site. Materials stored outside of the staging area are to be relocated as necessary or as directed by the Construction Manager to not impede the scheduled work of others.
 - Long term storage of deliverable materials shall not be stored in building and shall be stored either offsite, in staging area, or containers outside of the building to not obstruct construction activities.
 - (a) The Contractor shall replace all lost or damaged materials that have not been turned over to the Owner via signed and legible transmittal.
 - d. Secure Lock Up of Building and Site.
 - The General Contractor shall provide secure lockup of doors, windows, openings of the new building, and site gate/fence(s) at the end of each working day. If other contractors are working past the Project working hours preventing secure lock up, then the General Contractor is to notify the Construction Manager for further direction.
 - 2) If the General Contractor is not scheduled to be onsite, then it will be the responsibility of the Contractors working onsite that day to provide building and/or site lock up.
 - Propping open locked doors and leaving unattended will not be allowed by any Contractors. Personnel observed leaving doorways unsecure/propped and unattended may be directed to be removed from site.
 - 4) If the General Contractor or other solely working contractor (with no GC onsite) fails to provide secure lock up of the building and/or site at the end of each day, and has been documented at minimum of 3 instances, then the Construction Manager / Owner may provide their own building site lock up and deduct the labor costs from the responsible Contractor's contract sum.
 - e. Construction access to the site shall be limited to those designated for the contractor's personnel, equipment, and deliveries by the Owner. Contractors' staging, parking and storage shall be coordinated by the Construction Manager.
- J. CLEANING, AND PROTECTION

- 1. All Contractors are responsible for any debris caused by their work. A Daily Debris Cleaning and disposal are required by each Contractor for the time periods and areas in which that Contractor is performing work.
- 2. If Contractor Daily Debris Cleaning is deemed insufficient, then on a day selected by the Construction Manager, each trade will assign at least one person to the weekly clean-up until cleaning is complete. The name of this person is to be submitted to the Construction Manager. Any Contractor not providing personnel will be charged for cleaning labor provided by others or as supplied by the Construction Manager.
- 3. The General Contractor shall provide Final Cleaning Service of all spaces in the building scheduled on the Contract Documents for Construction by any of the other Contractor, and equipment provided immediately before the final inspection.
 - a. Provide professional cleaning of all dust and debris beyond the general Daily Debris Cleaning responsible by each contractor to restore all surfaces to a dust free condition.
 - b. This includes any dust that have resulted from Construction by other Contractors and is to be included in the final cleaning if there is work indicated in these associate spaces on the Contract Drawings.
 - c. This clause does not alleviate the other Contractors responsibility for Daily Debris Cleaning of debris or material.
 - d. Close off cleaned spaces from entry by other Contractors with visible indication.
 - e. Maintain, lock down, and secures areas from unauthorized access in a clean condition until the owner occupies the space.
 - f. Personnel: Qualified Professional Cleaners. To be submitted to the Construction Manager and submitted 2 weeks prior to the scheduled cleaning for approval.
 - g. The Contractor Responsible for Site work (Site Contractor) (or by General Contractor when no Site Contractor is contracted) shall be responsible for performing a final cleaning of the exterior site areas.
 - h. If a Contractor fails to provide their contractually obligated debris cleaning or final cleaning, then the Owner reserves the right to hire an outside cleaning contractor to perform the work on behalf of the Contractor until the cleaning requirements have been met and as required to meet the schedule.
 - i. Protection to be installed on all new floor surfaces and maintained until final coatings/waxes are installed, and then continued to be maintained until turnover to the owner. Heavy Duty Ram board to be installed in high traffic areas/egress pathways into each space or in areas where lighter protections cannot be maintained.
 - j. Furniture and Equipment in work areas shall be protected with plastic sheeting and maintained dust free through the period of active construction in the space. Reinstall sheeting as necessary due to damage during construction. Cleaning of unprotected furniture or equipment shall be the responsibility of the Contractor working in the associated space if protection is not installed.
 - k. Each Contractor shall close and protect their installed equipment or plumbing fixtures to prevent use during construction until the equipment or space has been turned over to the owner.
 - I. The Building Ventilation system shall be disabled by the Contractor(s) in areas under construction until the areas are cleaned and turned over to the owner. Dirty air filters from Construction are to be replaced with new filters and duct cleaning to be provided by Contractors who did not disable the Ventilation System during construction prior to Substantial Completion.
- K. EQUIPMENT AND SYSTEMS: START UP, DEMONSTRATION, AND TRAINING
 - 1. Each Contractor is required to provide Start Up and Test Documentation for all equipment and systems installed under its respective contract, to be witnessed by Owner's representative and Construction Manager.
 - a. Submit Start Up and Test Documentation for approval prior to equipment acceptance and warranty start date.

- b. Each Contractor is to provide Start-up Reports, any custom configurations of equipment, any observed issues/deficiencies with the equipment, and certification if equipment meets all per the Manufacturer and Engineer requirements.
 - Documentation of Construction Manager/Owners Representative witness of equipment or systems startup/testing does not constitute as acceptance of equipment or system.
 - 2) b. Provide Serial Numbers of all equipment with Maintenance Data.
- c. If Equipment or system failure is discovered during initial startup or testing, then the warranty for the failed equipment shall not start until the equipment is corrected.
- d. The Contractor is to submit a Demonstration and Training Agenda with Operation and Maintenance Data for Architect approval prior to scheduling Demonstration and Training.
- e. Training for Equipment or Systems shall not be scheduled until the equipment or system is accepted by the Architect.
- f. If Construction Manager is not notified 48 hours in advance and available to witness Equipment start up or training, then the Contractor shall pay all costs to repeat start up or training procedures again with the Construction Manager/Owner's representative as witness.
- g. In addition to specific training required in each specification sections, each contractor is required to provide (1) session of General Usage and Maintenance Training for all equipment, systems or work installed on the Project once the equipment, systems, or work is complete and accepted by the Engineer/Owner.
 - Contractor to prepare a written agenda for the Training sessions and provide training duration as required to review all agenda items. Submit Training Agenda for Architect Approval prior to scheduling training. The Contractor is to provide a sign-in sheet and video recording of session, Operation and Maintenance Data, and any other training documentation associated with training. Submit this Documentation with the Closeout Documents.
 - 2) Provide Serial Numbers of all equipment with Maintenance Data.
- h. If Equipment or system(s) being turned over to the owner for use prior to 100% completion and acceptance due to schedule and the equipment/system(s) is still not complete and accepted by the Engineer, then the Contractor is to provide additional training upon equipment turn over to owner to allow partial use of equipment without depleting original training sessions or hours required by contract for completed equipment.
- L. TEMPORARY FACILITIES RESPONSIBILITIES DESIGNATED RESPONSIBLE CONTRACTORS.
 - All sections shall be provided as referenced within Part 3 Execution Section of "011500 Temporary Facilities and Controls."
 - a. Temporary Portable Chemical Toilet Facilities: The General Contractor shall provide Temporary Portable Chemical Toilet Facilities for all construction personnel, Construction Manager, and all other Contractors.
 - b. Dumpsters:
 - 1) Dumpsters for work associated with the New Building are to be provided by the General Contractor for use by all Contractors working within the building (including other contractors providing work associated with Contract Drawings).
 - 2) The Contractor responsible for the Site Work (Site Contractor) shall provide disposal/removal/dumpsters for work associated with the Site/Civil Work.
 - c. Temporary Electric Power Service: The Electrical Contractor shall provide and maintain the Temporary Electric Power Service for: New Building, Staging Area, and (5) Contractor + (1) CM Trailer Connections.
 - 1) Each Contractor shall provide Generators as needed for their own work until the Temporary Electric Power Service is scheduled to be installed.
 - d. Temporary Lighting Service: The Electrical Contractor shall provide the Temporary Lighting Service for use by all contractors.

- 1) See Staging Area and Logistic Plan for additional requirements.
- e. Temporary Water Service: The Plumbing Contractor shall provide the Temporary Water Service for use by all contractors.
 - 1) Provide supply and refill of temporary potable water supply until final water service is scheduled to be installed.
 - 2) See Staging Area and Logistic Plan for additional requirements.
- f. Temporary Heating Service: The General Contractor shall provide Temporary Heating Service for the New Building.
 - 1) See Milestone Schedule for Scheduling of Building Enclosure and Final Cleaning permitting use of permanent HVAC.
- g. Temporary Barricades and Building Signage: The General Contractor shall provide Temporary Barricades.
 - 1) See Staging and Logistics Plan for additional requirements.
- h. Temporary Building Storm Drainage: The Plumbing Contractor to provide Temporary Building Storm Drainage.
- i. Temporary Staging Area, Access Roads, Site Signage, and Site Fence: The Contractor responsible for Site Work (or Site Contractor) shall provide Temporary Staging Area, Access Roads, and Site Fence for use by all contractors.
 - 1) See Staging and Logistics Plan for requirements.
- j. Building & Site Maintenance:
 - 1) The Contractor responsible for Site Work (Site Contractor) shall be responsible for Maintaining Temporary Access Roads and Existing Roads.
 - 2) The General Contractor shall be responsible for Snow/Ice Removal at Building/Adjacent sidewalks.
- k. Temporary Fire Extinguishers for Building Construction: The General Contractor shall provide Building Fire Extinguishers for Construction.
- 1.05 CONTRACT G GENERAL CONSTRUCTION WORK CONTRACT: (ALSO REFERRED TO AS: "GENERAL CONTRACTOR" OR "GC")
 - A. The Work of the General Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine ALL drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.
 - 1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as General Construction Work.
 - a. Drawings:
 - 1) All "G" Series Drawings (General)
 - 2) All "BS" Series Drawings (Boring for Soils)
 - 3) All "A" Series Drawings (Architectural) Provide all work shown.
 - 4) All "S" Series Drawings (Structural) Provide all work shown.
 - 5) All "C" Drawings (Civil) for details within Site/building delineation)
 - 6) All to be reviewed for Coordination:
 - (a) All "M" (Mechanical), "E" (Electrical), "FA" (Fire Alarm), "FP" (Fire Protection) and "P" (Plumbing) series drawings as it relates to the work of this contract.
 - 7) Specifications:
 - (a) Division 0 Procurement and Contracting Requirement, all Sections.
 - (b) Division 1 General Requirements, all Sections,
 - (c) Division 3 Concrete, all Sections.
 - (d) Division 4 Masonry, all sections.
 - (e) Division 5 Metals, all Sections.
 - (f) See Metals Delineation between GC and SC for Railings.
 - (g) Division 6 Woods and Plastics, all Sections.

- (h) Division 7 Thermal and Moisture Protection, all Sections.
- (i) Division 8 Openings, all Sections.
- (j) 089100 Louvers: HVAC Louvers Furnished by M.C., Installed by GC.
- (k) Division 9 Finishes, all Sections.
- (I) Division 10 Specialties, all sections.
- (m) Exclude 101453 Traffic Signs and 107500 Flagpoles: (By SC).
- (n) Division 11 Equipment.
- (o) Division 12 Furnishings
- (p) Division 13 Special Construction, all sections.
- (q) Division 14 Conveying Equipment, all Sections.
- (r) Division 26 Required sections as they relate to this contract for electrical work specifically indicated as required for this contract.
- (s) Division 31 Earthwork
- (t) See Earthwork Delineation between GC and SC.
- B. Coordination:
 - 1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
 - a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
 - b. Project Master Schedule development and submissions of 2-week look-ahead schedules.
 - c. Final Cleaning Schedule.
 - d. MEP work.
 - e. Casework with other wall mounted items.
 - f. Underground Utilities and Trench Locations.
 - g. Blocking for Wall Mounted Items.
 - h. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
 - i. Electrical Requirements and connections for Equipment.
 - j. Access Door locations.
 - k. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
 - I. Door Hardware Material Prep and Coordination with Security Contractor.
 - m. Temporary Enclosures and Building Access.
 - n. Temporary Facilities for use by other Contractors.
- C. Temporary Facilities
 - Provide Temporary Facility responsibilities indicated in "011200 Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
 - a. Additional Requirements indicated in "011500 Temporary Facilities and Controls."
- D. Common General Construction Requirements:
 - 1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
 - 2. Access Doors
 - a. Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor as required for maintenance, service, or code.
 - b. Provide installation of Access Doors furnished by other contractors in new wall or ceiling construction.
 - c. Include in base bid to furnish and install the following access doors beyond those already shown on drawings:
 - 1) (5) 18" x 18" fire-rated stainless steel access doors for either gypsum or masonry construction.

- e. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
 - 1) Includes Equipment Finishes and any other pre-painted finished items or devices prior to ordering of material.
- f. Provide blocking/reinforcement as needed for all wall/ceiling mounted items indicated on Contract Drawings.
- E. Identification and Labeling: Provide Labeling of all equipment installed under this Contract.
 - 1. Equipment Labelling shall be sized to be visible from ground level.
 - 2. Provide complete schedules of the following items:
 - a. Equipment Label Schedule with Equipment Model and Serial Numbers.
 - b. Maintenance and Test Interval Schedule of all equipment.
 - c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
 1) (Filters, Belts, Seals, Fluids, etc.)
 - d. Provide additional labels for equipment above ceilings or behind an Access Door and install Labels on Ceiling or Access Door.
- F. Electrical Wiring of Equipment and Devices:
 - 1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.
 - a. See "Electrified Door Hardware Wiring" Section of Electrical Contractor's Contract Summary for wiring supplied by Electrical Contractor for Electrified Door Hardware.
- G. Electrified Door Hardware Wiring:
 - 1. Electrified Door Hardware listed on Hardware Schedule to be furnished and mounted by the General Contractor.
 - 2. Line Voltage Power Wiring to be provided by Electrical Contractor to Electrified Door Hardware or Door Hardware Equipment per Hardware Schedule.
 - 3. Low Voltage Control Wiring for electrified hardware between devices listed on Hardware Schedule to be provided by Electrical Contractor.
 - 4. The General Contractor is to provide start up, configuration, and programing of all electrified door hardware and any ADA Electrified Hardware equipment listed in Hardware Schedule or furnished by the General Contractor.
 - 5. The General Contractor shall provide continuous internal raceways/pathways within new doors and frames for wiring all electric hardware or devices indicated on Contract Documents or Hardware Schedule to an accessible location for future wiring. General Contractor to install Access Door if needed. The General Contractor shall provide pull string from all device locations on hardware schedule to the accessible location above the ceiling.
- H. Site/Civil work Scope Delineation between General Contract (Contract #1) and Site Contractor (Contract #5): Civil/Site Work provided by General Contractor (Contract #1) indicated below:
 - Site/Civil work "Scope Delineation Areas": The New Building + 5-Foot Zone from perimeter of foundations of locations are designated as responsible by: General Contractor (Contract #1). All other Site/Civil work outside these areas is designated by Site Contractor (Contract #5).
 - 2. Survey and Layout (per respective designated "Scope Delineation Areas"):
 - a. Provide services of a licensed surveyor to provide layout required for all new work.
 - b. For areas within new building footprints, provide field markings of: new building layout, column line layout, finished floor elevations, and as-built point of reference locations.

- c. Site Contractor shall provide utility mark out of any existing utilities on site including areas designated as responsibility by General Contractor within "Scope Delineation Areas".
- d. Provide maintenance of surveyor layout and existing utility markings throughout the duration of the project and restore markings if disturbed during construction.
- e. Provide surveyed as-built locations and elevations of all underground utilities excavated by this contract, all to be recorded and supplied on CAD and PDF As-Built Drawings.
- f. Site Demolition: The Site Contractor is to provide all demolition as indicated on Civil Drawings, including within areas designated as responsibility by General Contractor within "Scope Delineation Areas". Including Removing Existing Vegetation, Clearing, Grubbing, Stripping Topsoil, removal of existing above/below grade site features and improvements and backfill after removal, removal of existing utilities and backfill after removal, and all other demolition indicated on Civil Demolition Drawings.
- g. Site Landscaping: Landscaping, Topsoil, Turfs and Grasses, Plantings, and Restoration shall be provided by the Site Contractor as indicated on Civil Drawings including within areas designated as responsibility by General Contractor within "Scope Delineation Areas".
- h. Earthwork: The General Contractor or Site Contractor (per their respective designated "Scope Delineation Areas") are to provide all site earthwork, excavation, bedding, backfill, subbase, and base material, including dewatering as required for the installation of work of this Contract:
 - General Excavation: Excavations shall be in comply with current OSHA requirements. Structure Excavation shall be made to the elevations, slopes and limits shown on the plans. Bottom of excavations shall be level and in firm, solid material; where soft or otherwise unsuitable material is encountered, such material shall be removed and replaced with properly compacted earth material, stone or flowable fill, as directed by the Architect. The Contractor is to provide specified backfill as indicated in Specifications.
 - (a) Excavated material suitable for fill or backfill shall be stockpiled on the site to be turned over to Site Contractor for future use. Excess Material shall be properly disposed of by Site Contractor.
 - (b) Dewatering: An adequate dewatering system shall be provided at all structure excavations and elsewhere as required. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress.
 - (1) Excavated areas shall be kept free of water during construction. Where necessary, excavations shall be protected by shoring, sheeting, cofferdams, or other suitable methods. Dewatering shall remain until no longer necessary.
 - (2) The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation.
 - (3) Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage and does not cause damage to any portion of the work or adjacent property.
 - (4) All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage.
 - (5) The dewatering system shall be maintained until backfilling is complete.
 - (6) All damages resulting from the dewatering shall be repaired by the Contractor to the satisfaction of the Architect and at no cost to the Owner.
- i. Utility Trench Excavation: For all underground utilities shown on any Contract Drawings, the General Contractor or Site Contractor (per their respective designated

"Scope Delineation Areas") are to provide: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.

- j. Utility Trench Excavation is to be provided for (but not limited to) the following utilities:
 - 1) See 1.4 section G. of 011200 for Typical Utility Trench Excavation Types.
 - General Contractor is to provide any foundation footing drains indicated on Architectural Drawings at the foundation, and Site Contractor to provide drain piping from 5 feet outside building perimeter as indicated on Civil Drawings.
- k. Site Concrete:
 - The General Contractor will provide all foundation walls, retaining walls, and staircases (including landings at each end of the staircase) as specifically indicated in Structural Drawings, even if depicted on exterior of building. Sidewalks or Slabs within these retaining walls, foundation walls, or staircase landings shall be provided by the General Contractor.
 - 2) The Site Contractor shall provide the first exterior concrete landing or sidewalk panels outside of all exterior doors to the first exterior expansion or control joint.
 - (a) Expansion Joints between interior and exterior slabs at doorways shall transition under each building exterior door transition or threshold. Caulk Joint to be provided by Site Contractor at Transitions.
 - (b) Site Contractor to provide all concrete stairs, sidewalks, slabs, pads, retaining walls, and other concrete features/concrete work including railings indicated on Civil Drawings that are not specifically indicated to be provided by General Contractor.
 - (c) Provide shop drawings for all concrete/railing work including field measurements and elevations of any existing connection locations prior to installation. General Contractor and Site Contractor shall coordinate concrete transitions prior to performing any concrete work.
 - (d) Each Contractor is to provide their own concrete wash out areas and restoration as required for their own work.
- I. Concrete and Masonry:
 - 1. Provide equipment pads when indicated on Architectural or Structural Contract Drawings.
 - 2. Provide all concrete and masonry work indicated on Structural or Architectural Drawings. Coordinate with all other Contractors for openings and penetrations shown on all other Contract Drawings.
 - 3. Loose Masonry lintels are furnished, installed, and grouted by General Contractor for openings required for their own work and openings required by Other Contractors for work shown on all other Contract Drawings.
 - 4. Install concrete and masonry sleeves as furnished by Other Contractors in new wall or floor construction for work shown on other Contract Drawings.
 - 5. Provide Cold Weather Protection where weather conditions cause protections to be required. Protect Concrete and Masonry from cold temperatures during and after pour. Submit Cold Weather Protection Plan prior to Cold Weather Construction.
- J. Metals:
 - 1. Provide all steel beams / columns and associated lintels at new openings as shown.
 - 2. Install miscellaneous metal fabrications furnished by other contractors but scheduled to be installed under the General Construction Contract as shown and/or specified in the contract documents.
- K. Louvers:
 - 1. Furnish and install Louvers indicated in new window/curtainwall systems only and were indicated on Architectural Drawings.

- L. Roofing:
 - 1. Provide all roofing work for new building. Roof blocking and plywood, including:
 - 2. For cutting holes through new deck, the following shall apply:
 - a. Temporary and final roofing and weather-tight protection for roof at new building shall be by the General Construction Contractor.
 - b. Flashing and counter flashing for all penetrations.
 - c. On Flat Roofs, provide roof walkway pads entirely around roof mounted mechanical equipment even if not indicated on Roofing/Architectural Drawings.
- M. Doors, Frames, and Hardware:
 - 1. The General Contractor is required field verify and measure all existing conditions and openings prior to ordering Door/Frame/Hardware material. The General Contractor is to coordinate hardware selections to confirm there are no interference between selected hardware and/or recessed/morticed hardware prep or glazing in doors. The General Contractor is to coordinate and confirm there will be no conflicts between glazing, closers, overhead stops, coordinators, door holders,
 - 2. The GC is required to verify closer type/configuration/mounting position submitted is coordinated with installation conditions and includes sufficient swing radius for electromagnetic door holders, or closer stop position where wall stop will not properly stop door and overhead stop is not included in hardware schedule. Coordinate with adjacent wall conditions. Provide blocking in partitions behind all new Door Wall Stops.
 - 3. The GC is to provide continuous adjustment of Door Hardware until all hardware functions properly for 1 final inspection of all Door Hardware.
- N. Finishes: Provide all finishes indicated in Division 9. Review existing conditions and confirm acceptable substrates prior to installing new finishes. Do not proceed with installations if conditions are not satisfactory for new work.
 - 1. Provide self-leveling underlayment as required to allow for an acceptable flooring installation.
 - If conditions/substrates are not acceptable for finish work installation, notify the Construction Manager/Architect and/or submit an RFI requesting direction if further action is needed. Do not install finishes if existing conditions are not acceptable per manufacturers requirements.
- O. Commissioning:
 - 1. Provide commissioning and startup of all equipment installed under this contract. Submit Documentation for approval prior to equipment acceptance and warranty start date.
- P. Owner Training: (all Training to meet requirements of Demonstration Training Specification)
 - 1. Provide General Overall Systems Training.
 - 2. Provide all Demonstration and Training Requirements per Specification
 - 3. In addition to specification requirements, provide Demonstration and Training on the following items upon equipment/system completion and acceptance:
 - a. Elevator.
 - b. Door Hardware.
 - c. Roof Maintenance.
 - d. Interior Finish Maintenance.
 - e. Emergency Eyewash Station.
 - f. Firematic Equipment.
 - g. Cooking/Kitchen Equipment.
- Q. Project Specific Requirements:
 - 1. Trench Drains within in the building on Plumbing Drawings are to be furnished by Plumbing Contractor and turned over to the General Contractor for installation at proper

elevation. Plumbing Contractor shall then connect to Trench Drains once set. Plumbing Contractor to coordinate with GC regarding Top of Drain elevations.

- 2. Electrical Contractor to provide Control Wiring for GC provided Overhead/Four-Fold Apparatus Bay Doors and devices (for both Alternate Options). Plumbing Contractor to adjust Layout of Sprinkler Piping at Doors affected by Alternate and include in Base Bid (for both Alternate Options).
- For the Pre-Engineered Wood Frame Building 133400: Site Contractor shall provide Concrete Slab/Pad and all excavations for MEP utilities. General Contractor shall provide all other remaining work including the complete Structure, and any foundation work required.
- 4. HVAC Louvers in new Exterior Walls: Mechanical Contractor shall furnish all exterior Louvers that are to be placed in exterior walls and shall turn over to the General Contractor for installation, finish, and sealing to the building envelope.
- 5. Provide Temporary Heat upon Building Enclosure and Exterior Work Winter Condition Protections for duration indicated on Milestone Schedule to allow work to continue during cold weather conditions per Milestone Schedule.
- 1.06 CONTRACT M MECHANICAL CONSTRUCTION WORK CONTRACT: (ALSO REFERRED TO AS: "MECHANICAL CONTRACTOR" OR "MC")
 - A. The Work of the Mechanical Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine ALL drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.
 - 1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Heating, ventilating, cooling, and controls work.
 - a. Drawings:
 - 1) All "G" Drawings (General).
 - 2) All "M" Mechanical Series Drawings Provide all work.
 - 3) All to be reviewed for typical details and coordination of all work:
 - (a) All "A" (Architectural), "S" (Structural), "C" (Civil), "E" (Electrical), and "P" (Plumbing) series drawings as it relates to the work of this contract.
 - 4) Specifications:
 - (a) Division 0 Procurement and Contracting Requirement, all sections.
 - (b) Division 1 General Requirements, all sections.
 - (c) Division 7 –Penetration & Joint Firestopping and Joint Sealants, as required for the Work of this Contract.
 - (d) Division 8 Openings
 - (e) Louvers: Furnish to GC for Install.
 - (f) Provide Access Doors, as required.
 - (g) Division 9 Painting as required when specifically indicated.
 - (h) Division 23 HVAC, all sections.
 - (i) Division 26 Required sections as they relate to this contract for electrical work specifically indicated as required for this contract.
 - B. Coordination:
 - 1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
 - a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
 - b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
 - c. Final Cleaning Schedule.

- d. MEP work.
- e. Blocking for Wall Mounted Equipment.
- f. Casework with other wall mounted items.
- g. Underground Utilities and Trench Locations.
- h. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
- i. Electrical Requirements and connections for Equipment.
- j. Access Door locations.
- k. Temporary Enclosures and Building Access.
- I. Temporary Facilities for use by other Contractors.
- C. Temporary Facilities
 - 1. Provide Temporary Facility responsibilities indicated in "011200 Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
 - a. Additional Requirements indicated in "011500 Temporary Facilities and Controls."
- D. Common Mechanical requirements:
 - 1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
 - 2. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor as required for maintenance, service, or code.
 - 3. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
 - 4. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
 - a. Includes Equipment Finishes and any other pre-painted finished items or devices prior to ordering of material.
 - b. Furnish motor controllers, equipment disconnects, and variable frequency drives to Electrical Contract for installation and wiring where not indicated on Electrical Drawings.
 - c. Furnish HVAC equipment roof supports, curbs, and pipe portals.
 - d. Provide insulation of all modified piping, ductwork, and equipment.
 - e. Provide additional isolation valves as needed for contractor's convenience or as needed to maintain project schedule via means and methods.
 - f. Provide complete finished installation of equipment, duct work, metal chases with all paint as needed to provide a complete finished system.
 - g. Provide Duct painting of all exposed ductwork not covered by a ceiling unless indicated painting of exposed ceiling system / mechanical systems by General Contractor per Architectural Drawings / Architectural Finish Schedule.
 - h. For Equipment provided with Packaged Controls, provide Equipment devices and accessories to all the Controls Contractor (or Subcontractor) the ability to perform complete integration of Equipment's functions into Building Management System.
 - 1) Provide Package Controls Integration Control Points and Equipment Sequence of Operations to Engineer as Submittal for Engineer approval prior to ordering equipment.
 - i. Filters: Provide at minimum: (1) replacement set of filters for all equipment to be turned over to the owner with equipment filter schedule that includes all information/sizes/models/quantities needed for the owner to purchase new filters for all equipment.
 - 1) Provide replacement filters for any equipment that ran during construction prior to final cleaning. Provide duct cleaning for any ductwork utilized during construction as needed.

- E. Identification and Labeling: Provide Labeling of all piping, duct work, equipment, valves, control valves, dampers, junction boxes, panels, electrical devices, and electrical connections installed under this Contract.
 - 1. For electrical connection labelling: Indicate Panel and Circuit of all electrical devices, outlets, or other power connections for all equipment.
 - 2. Equipment, Piping, Control Valve, and Duct Labelling shall be sized to be visible from ground level.
 - 3. Provide complete schedules of the following items:
 - a. Equipment Label Schedule with Equipment Model and Serial Numbers.
 - b. Maintenance and Test Interval Schedule of all equipment.
 - c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
 - 1) (Filters, Belts, Seals, Fluids, etc.)
 - (a) Valve Tag / Valve Label Schedule. (Indicate Normal Position (Open or Closed), and Valve Function).
 - (b) Panel Schedules for all new or modified Electrical/Control Panels by this Contract.
 - d. Provide additional labels for valves, dampers, devices, or equipment above Ceilings or behind an Access Door, and install Labels on Ceiling or Access Door.
- F. Electrical Wiring of Equipment and Devices:
 - 1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.
- G. HVAC Controls: Mechanical Contractor to provide all Controls Responsibilities for HVAC Equipment as indicated in Contract Documents and per Controls Specification.
- H. Common Controls Requirements:
 - 1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
 - 2. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor as required for maintenance, service, or code.
 - 3. Provide all wiring, devices, and accessories for a complete system to meet all design intent requirements.
 - 4. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
 - a. Includes Equipment Finishes and any other pre-painted finished items or devices prior to ordering of material.
 - b. Provide complete finished installation of equipment with all paint as needed to provide a complete finished system.
 - c. Provide all electrical work required for Controls Systems in compliance with respective sections of Division 26 Electrical/Communication for wiring, cables, boxes, conduits, breakers, thermostats, identification.
 - d. Provide integration into Fire Alarm System to monitor and process Fire Alarm Control Sequences.
 - e. Provide log of issues identified to impact the performance of system meeting design requirements and identify the Ball in Court of the issue and provide to Construction Manager on a biweekly basis.
 - f.
 - g. Provide Adjustments and Programming from 6 Months after acceptance to adjust Controls System as requested by Owner to meet design intent and improve ease of use. Owner to provide an itemized list of requested Changes.

- I. Graphical User Interface of Building Manage System:
 - 1. Graphical User Interface shall be a complete and intuitive system to achieve operation as designed in Controls Specification. Provide symbols and graphics that accurately represent the system installed.
 - a. Provide Submittal of Sample Graphics or Screenshots of all graphics for review. Graphics to be reviewed by Architect and Owner prior to Acceptance.
 - b. Final Sequence of Operations shall be available to be viewed per space.
 - c. All Symbols, Abbreviations, Colors, and other distinctions shall be reference with a key that displays the definition of each item.
 - d. Provide Alarm Tracking with date and time stamps. Allow filtering to distinguish between alarms per area, per equipment, and status of alarm. Provide distinctions between alarms that have been acknowledged vs have not been acknowledged, and alarms that are currently active vs inactive. Highlight areas that have an active alarm on the Floor Plan that displays the equipment.
 - e. Provide tracking of equipment monitoring history to allow the Owner to view the status of the equipment from previous points in time.
 - f. Request information from the Owner for Default Settings of Controls systems, including but not limited to Default Temperature Set Points, Building Schedules, Occupancy Schedules. Include a copy of the default settings with Record Documents. Provide Function to allow owner to reset the system to default settings.
 - g. Provide custom adjustable set points per space to allow owner to have varying temperature set points within different areas of the building. Provide Function to allow owner to reset the system to the custom adjustable set points.
 - h. Identify on BMS the adjustments that correspond with Testing and Balancing Reports for each adjustable setting at each adjustment field (Motor Speeds, Damper Positions, Control Valve positions, etc.). Include these values with Record Documents.
- J. Testing, Adjusting, and Balancing:
 - 1. Provide Testing, Adjusting, balancing of all new HVAC systems to be included in this contract per Testing and Balancing Specification. Provide 2nd shift Hours when these activities are scheduled while spaces are occupied by the Owner.
- K. Commissioning:
 - 1. Provide commissioning and startup of all equipment installed under this contract. Submit Documentation for approval prior to equipment acceptance and warranty start date.
 - 2. Provide onsite commissioning assistance and all other responsibilities required by Mechanical Contractor indicated in Mechanical Commissioning Specification.
 - 3. Provide 2nd shift Hours when these activities are scheduled while spaces are occupied by the Owner.
- Dwner Training: (all Training to meet requirements of Demonstration Training Specification)
 Provide General Overall Systems Training.
 - 2. Provide all Demonstration and Training Requirements per Specification
 - 3. In addition to specification requirements, provide Demonstration and Training on the following items upon equipment/system completion and acceptance:
 - a. (3) 4 Hour Sessions of Training on HVAC Controls. One Session required prior to Substantial Completion.
 - b. Each Type of HVAC Equipment indicated on Mechanical Equipment Schedules on Mechanical Drawings.
- M. Project Specific Requirements:
 - Mechanical Contractor to provide complete HVAC Kitchen Hood System and Ansul System including all Control Wiring and Wall Switch. Electrical Contractor to provide Power and Fire Alarm Connection as indicated on Electrical Drawings. Furnish Emergency

Gas Shut Off Valve and turn over to Plumber for install. MC to provide Control Wiring to Gas Shut Off for Kitchen Equipment.

- 2. Provide all locals Controls to all HVAC Equipment as depicted on Contract Documents and as required to achieve specified Sequence of Operation including connection between multiple equipment serving individual spaces.
- 3. Vehicle Exhaust Fans have a portion of the Equipment provided by Owner, refer to Contract Documents for details identifying components provided by Owner vs by Mechanical Contractor.
- 4. Electrical Contractor shall provide Line Voltage Controls for Exhaust Fans (Equipment Tagged as: GFX) per Electrical Drawing details.
- 5. HVAC Louvers in new Exterior Walls: Mechanical Contractor shall furnish all exterior Louvers that are to be placed in exterior walls and shall turn over to the General Contractor for installation, finish, and sealing to the building envelope.
- 1.07 CONTRACT E ELECTRICAL CONSTRUCTION WORK CONTRACT: (ALSO REFERRED TO AS: "ELECTRICAL CONTRACTOR" OR "EC")
 - A. The Work of the Electrical Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine ALL drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.
 - 1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Electrical Construction work.
 - a. Drawings:
 - 1) All "G" Series Drawings (General)
 - 2) All "E" Electrical Series Drawings Provide all work.
 - 3) All "FA" Fire Alarm Series Drawings Provide all work.
 - 4) All to be reviewed for typical details and coordination of all work:
 - (a) All "A" (Architectural), "S" (Structural), "C" (Civil), "M" (Mechanical), and "P" (Plumbing) series drawings as it relates to the work of this contract.
 - (b) Utility disconnects for buildings scheduled to be removed as shown on the Demolition Site Plan CD 100.
 - 5) Specifications:
 - (a) Division 0 Procurement and Contracting Requirement, all Sections.
 - (b) Division 1 General Requirements, all sections.
 - (c) Division 3 Concrete, as required.
 - (d) Division 7 Penetration & Joint Firestopping and Sealants, as required.
 - (e) Division 8 Access Doors as required.
 - (f) Door Hardware Schedule for Electrified Hardware Wiring, as required.
 - (g) Division 9 Painting as required when specifically indicated.
 - (h) Division 11 Includes Vehicle Charging Stations and Projection Screens.
 - (i) Excludes Firematic Equipment.
 - (j) Division 22 All sections as relates to this contract for electrical connections to equipment.
 - (k) Division 23 All sections as relates to this contract for electrical connections to equipment.
 - (I) Division 26 Electrical, all sections.
 - (m) Division 28 Electronic Safety and Security, all sections.
 - B. Coordination:
 - 1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:

- a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
- b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
- c. Final Cleaning Schedule.
- d. MEP work.
- e. Blocking for Wall Mounted Equipment.
- f. Casework with other wall mounted items.
- g. Underground Utilities and Trench Locations.
- h. Blocking for Wall Mounted Equipment Including AV Displays indicated on "TA" Drawings.
- i. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
- j. Electrical Requirements and connections for Equipment.
- k. Access Door locations.
- I. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
- m. Temporary Enclosures and Building Access.
- n. Temporary Facilities for use by other Contractors.
- C. Temporary Facilities
 - 1. Provide Temporary Facility responsibilities indicated in "011200 Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
 - a. Additional Requirements indicated in "011500 Temporary Facilities and Controls."
- D. Common Electrical Requirements:
 - 1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
 - 2. Utility disconnects for structures noted to be demolished.
 - 3. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor as required for maintenance, service, or code.
 - 4. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
 - 5. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
 - a. Includes Equipment Finishes, cover plates, exposed conduits/wire mold, and any other pre-painted finished items or devices prior to ordering of material.
 - b. See Architectural Elevations for additional information for locations of wall mounted devices and coordination with other wall mounted items or finishes.
 - c. Provide all power wiring to all HVAC equipment.
 - 1) (Install motor controllers or disconnects supplied by Mechanical Contractor when motor controllers or disconnects are not indicated on Electrical Drawings).
- E. Identification and Labeling: Provide Labeling of all equipment, junction boxes, panels, electrical devices, and electrical connections installed under this Contract.
 - 1. For electrical connection labelling: Indicate Panel and Circuit of all electrical devices, outlets, or other power connections for all equipment.
 - 2. Equipment Labelling shall be sized to be visible from ground level.
 - 3. Provide complete schedules of the following items:
 - a. Equipment Label Schedule with Equipment Model and Serial Numbers.
 - b. Maintenance and Test Interval Schedule of all equipment.
 - c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
 - 1) (Filters, Belts, Seals, Fluids, etc.)
 - (a) Panel Schedules for all new or modified Electrical/Control Panels by this Contract.

- d. Provide additional labels for equipment above Ceilings or behind an Access Door and install Labels on Ceiling or Access Door.
- F. Electrical Wiring of Equipment and Devices:
 - 1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.
- G. Electrified Door Hardware Wiring:
 - 1. Electrified Door Hardware listed on Hardware Schedule to be furnished and mounted by the General Contractor.
 - 2. Line Voltage Power Wiring to be provided by Electrical Contractor to Electrified Door Hardware or Door Hardware Equipment per Hardware Schedule.
 - 3. Low Voltage Control Wiring for electrified hardware between devices listed on Hardware Schedule to be provided by Electrical Contractor.
 - 4. The General Contractor is to provide start up, configuration, and programing of all electrified door hardware and any ADA Electrified Hardware equipment listed in Hardware Schedule or furnished by the General Contractor.
 - 5. The General Contractor shall provide continuous internal raceways/pathways within new doors and frames for wiring all electric hardware or devices indicated on Contract Documents or Hardware Schedule to an accessible location for future wiring. General Contractor to install Access Door if needed. The General Contractor shall provide pull string from all device locations on hardware schedule to the accessible location above the ceiling.
- H. Electric Service:
 - 1. Provide complete Electric Service as indicated on Electrical Drawings.
- I. Telecommunications and Data Systems:
 - 1. Provide complete Telecommunications Data Wiring tested, terminated, labeled at both ends, and labels marked on As-builts.
 - 2. Provide all Commissioning and Testing Procedures and Documentation for Telecommunications Work.
- J. Fire Alarm System
 - 1. Provide complete Fire Alarm system as indicated in Contract Documents.
 - 2. Provide integration to existing fire alarm devices and systems where required.
 - 3. Electrical Contractor to provide power to Fire Alarm Control Panel and sufficient conduits from Fire Alarm Control Panel to above ceiling to contain all fire alarm wiring.
 - 4. Provide Fire Alarm Test Reports confirming all Equipment provided by Others in which the Fire Alarm System connects to, operates as designed and intended.
- K. Identification of Electrical:
 - 1. Provide updated Panel Schedules and Labeling in Electrical Panels for all circuit breakers installed or changed under this contract.
 - 2. Provide Labelling all electrical junction boxes with Panel Labels and Circuit Breaker Number that feeds each Junction Box.
 - 3. Provide Labelling of all outlets, devices, and equipment indicating Panel Labels and Circuit Breaker Numbers.
 - 4. Provide Labelling of all Data/Telecommunication Lines installed under this Contract at each end of the line.
- L. Electrical Site Work:
 - 1. The following items shall be furnished by Electrical Contractor and turned over to be set by Site Contractor as indicated on Electrical or Civil Drawings: Light Pole Bases, Camera Pole Bases, Electric Manholes or vaults, and Electrical Hand Holes.

- 2. General Contractor or Site Contractor shall provide "Utility Trench Excavation" to the Electrical Contractor for:
 - a. Utility Trench Excavation: For all underground utilities: General Contractor or Site Contractor is to provide Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
 - b. Utility Trench Excavation will be provided for the following utilities:
 - 1) All underground Electrical, Telecommunications, Data or Fiber utilities and conduits shown on Electrical or Civil Drawings.
 - 2) Underground Panel Feeder Conduits for each Electrical Panel shown on Electrical Drawings.
 - 3) Floor boxes and associated conduits indicated on Electrical Drawings.
- M. Commissioning:
 - 1. Provide commissioning and startup of all equipment installed under this contract. Submit Documentation for approval prior to equipment acceptance and warranty start date.
 - 2. Provide all responsibilities associated with the Mechanical Contractor as indicated in Mechanical Commissioning Specification.
- N. Owner Training: (all Training to meet requirements of Demonstration Training Specification)
 - 1. Provide General Overall Systems Training.
 - 2. Provide all Demonstration and Training Requirements per Specification
 - 3. In addition to specification requirements, provide Demonstration and Training on the following items upon equipment/system completion and acceptance:
 - a. Low Voltage Wiring.
 - b. Panel Boards and Switches.
 - c. Generator System with Transfer Switch and Load Bank/Controller.
 - d. Lighting System.
 - e. Fire Detection System.
 - f. Projection Screen.
 - g. Vehicle Charging Stations.
- O. Project Specific Requirements:
 - 1. Electrical Contractor shall provide Line Voltage Controls for Exhaust Fans (Equipment Tagged as: GFX) per Electrical Drawing details.
 - 2. Electrical Contractor to provide Concrete Pad for Generator.
 - 3. Electrical Contractor to provide future conduits through foundation for Power and Controls for future irrigation system as shown on Site, Plumbing, and Electrical Drawings.
 - 4. Electrical Contractor to provide complete Generator and Load Bank system including Concrete Pad for Generator. Site Contractor to provide grading and subbase for Pad and all Bollards.
 - 5. Plumbing Contractor to provide Oil Water Separator and all Accessories, Piping, Vents, Devices, Concrete Deadman's, and Valves as shown on P Drawings and outlet piping 5 Feet from Oil Water Separator. Plumbing Contractor to provide Start Up and Commissioning of System. Site Contractor to provide Excavation and Back Fill for this Equipment and conduits. Site Contractor to provide remaining drainage piping after transition from 5 FT after outlet. Electrical Contractor to provide Control Wiring of Oil Water Separator. Site Contractor to provide finish grade elevation to Plumbing Contractor for Coordination and shall excavate to the appropriate depth to achieve proper finish grades at the top of the Structure. Site Contractor shall provide Concrete Pad at the Top of Structure aligned with Paving.
 - 6. The Site Contractor shall provide all work associated with the Fueling Station as shown on P Drawings including Pads and Bollards. Electrical Contractor providing control wiring for

- 7. The Plumbing Contractor shall provide the Entire Exterior Domestic and Fire Service Backflow Equipment including Concrete Pad and Heated Enclosure. Outlet for Heated Enclosure to be provided by Electrical Contractor. Bollards to be provided by Site Contractor.
- 8. Mechanical Contractor to provide complete HVAC Kitchen Hood System and Ansul System including all Control Wiring and Wall Switch. Electrical Contractor to provide Power and Fire Alarm Connection as indicated on Electrical Drawings. Furnish Emergency Gas Shut Off Valve and turn over to Plumber for install. MC to provide Control Wiring to Gas Shut Off for Kitchen Equipment.
- 9. Electrical Contractor to provide Control Wiring for GC provided Overhead/Four-Fold Apparatus Bay Doors and devices (for both Alternate Options). Plumbing Contractor to adjust Layout of Sprinkler Piping at Doors affected by Alternate and include in Base Bid (for both Alternate Options).
- 1.08 CONTRACT P PLUMBING CONSTRUCTION WORK CONTRACT: (ALSO REFERRED TO AS: "PLUMBING CONTRACTOR" OR "PC")
 - A. The Work of the Plumbing Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine ALL drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.
 - 1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Plumbing Construction work.
 - a. Drawings:
 - 1) All "G" Series Drawings (General)
 - 2) All "P" Plumbing Series Drawings Provide all work.
 - 3) All "FP" Fire Protection Series Drawings Provide all work.
 - 4) All to be reviewed for typical details and coordination of all work:
 - (a) All "A" (Architectural), "S" (Structural), "C" (Civil), "M" (Mechanical), and "E" (Electrical) series drawings as it relates to the work of this contract.
 - (b) Gas and water utility disconnects for buildings scheduled to be demolished on Demolition Site Plan CD 100.
 - 5) Specifications:
 - (a) Division 0 Procurement and Contracting Requirement, all Sections.
 - (b) Division 1 General Requirements, all sections.
 - (c) Division 7 Penetration & Joint Firestopping and Sealants, as required.
 - (d) Division 8 Access Doors, as required.
 - (e) Division 21 -Fire Suppression, all sections.
 - (f) Division 22 Plumbing, all sections.
 - (g) Division 26 Required sections as they relate to this contract for electrical work specifically indicated as required for this contract.
 - (h) Division 33 Utilities, as required for New Water Utilities.
 - B. Coordination:
 - 1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
 - a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
 - b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
 - c. Final Cleaning Schedule.

- d. MEP work.
- e. Blocking for Wall Mounted Equipment.
- f. Casework with other wall mounted items.
- g. Underground Utilities and Trench Locations.
- h. Wall, Floor, Roof, Foundation: Penetrations, Openings, and Reinforcements.
- i. Electrical Requirements and connections for Equipment.
- j. Access Door locations.
- k. Embed Floor Items: floor boxes, floor drains/sinks/clean outs, etc.
- I. Temporary Enclosures and Building Access.
- m. Temporary Facilities for use by other Contractors.
- C. Site Plumbing Utility Coordination Storm Drain Piping, Gas Service, Sanitary Piping, and Water Line or Water Service Piping:
 - 1. Plumbing Contractor shall provide Sanitary and Storm Piping indicated on Plumbing Drawings for connection from 5' outside building foundation perimeter.
 - 2. Site Contractor shall provide Sanitary and Storm Piping indicated on Civil Drawings for connection at 5' from outside building foundation perimeter.
 - 3. Plumbing Contractor to provide the entire Water Main Piping Assembly as depicted on Plumbing Drawings. Utility Trench Excavation by Site Contractor.
 - 4. Plumbing contractor shall coordinate with gas utility for on-site gas service up the meter installation. Plumbing contractor is responsible for all gas piping to the gas generator and any other gas appliances shown on the utility plan, trenching by Site Contractor.
 - 5. Site Contractor and Plumbing Contractor shall coordinate this work prior to installation.
- D. Temporary Facilities
 - 1. Provide Temporary Facility responsibilities indicated in "011200 Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
 - 2. Additional Requirements indicated in "011500 Temporary Facilities and Controls."
- E. Common Plumbing Requirements:
 - 1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
 - 2. Utility disconnects for existing gas and water services at buildings scheduled for demolition.
 - 3. Access Doors: Furnish Access Doors as needed for access of concealed items installed under this contract to be installed by General Contractor (Contract #1) as required for maintenance, service, or code.
 - 4. Provide structural support of all wall or ceiling hung equipment from Building Super Structure.
 - 5. Provide Submittal of finishes for color selections of all exposed finished products or equipment:
 - a. Includes Equipment Finishes, cover plates, exposed conduits/wire mold, and any other pre-painted finished items or devices prior to ordering of material.
 - b. See Architectural Elevations for additional information for locations of wall mounted fixtures and plumbing devices.
 - c. Provide single piece properly sized Piping Escutcheons on all exposed piping penetrations at plumbing fixtures that properly cover any exposed unfinished surfaces.
 - d. Provide all testing, balancing, and disinfection of all new and modified Plumbing Systems.
 - 1) Submit Documentation of procedures and results for approval.
- F. Identification and Labeling: Provide Labeling of all piping, equipment, and valves installed under this Contract.

- 1. Equipment, Piping, and Control Valve Labelling shall be sized to be visible from ground level.
- 2. Provide complete schedules of the following items:
 - a. Equipment Label Schedule with Equipment Model and Serial Numbers.
 - b. Maintenance and Test Interval Schedule of all equipment.
 - c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
 - 1) (Filters, Belts, Seals, Fluids, etc.)
 - (a) Valve Tag / Valve Label Schedule. (Indicate Normal Position (Open or Closed), and Valve Function).
 - d. Provide additional labels for valves, dampers, or equipment above Ceilings or behind an Access Door, and install Labels on Ceiling or Access Door.
- G. Electrical Wiring of Equipment and Devices:
 - 1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.
- H. Fire Protection System: Provide Fire Protection system as indicated on FP-101. Wiring of Clean Agent Fire Suppression System Control Panel by the Plumbing Contractor.
 - 1. Provide per 212200 Clean Agent Fire Suppression and 210500 Common Work Results for Fire Suppression.
 - 2. Coordinate with Fire Alarm Contractor for Connection of Fire Suppression System to Fire Alarm System.
 - 3. 120 VAC Power Supply provided by EC to Fire Protection Control Panel.
 - 4. Internal Control Wiring for Fire Protection System, Programing, and commissioning of Clean Agent Fire Suppression Control Panel by Plumbing Contractor.
- I. Commissioning:
 - 1. Provide commissioning and startup of all equipment installed under this contract. Submit Documentation for approval prior to equipment acceptance and warranty start date.
- J. Owner Training: (all Training to meet requirements of Demonstration Training Specification)
 - 1. Provide General Overall Systems Training.
 - 2. Provide all Demonstration and Training Requirements per Specification
 - 3. In addition to specification requirements, provide Demonstration and Training on the following items upon equipment/system completion and acceptance:
 - a. Oil Water Separator.
 - b. Exterior Backflow Equipment.
 - c. Gas Piping including Shut Off Valve Locations.
 - d. Domestic Hot Water System.
 - e. General Overview of Domestic Water Piping Valves, Pumps, and Cleanouts for Sanitary and Storm.
 - f. Fire Sprinkler System.
 - g. Elevator Sump Pump.
 - h. Compressed Air System.
 - i. Gas Booster Pumps.
 - j. Water Coolers.
- K. Project Specific Requirements:
 - 1. Plumbing Contractor to provide Oil Water Separator and all Accessories, Piping, Vents, Devices, Concrete Deadman's, and Valves as shown on P Drawings and outlet piping 5 Feet from Oil Water Separator. Plumbing Contractor to provide Start Up and Commissioning of System. Site Contractor to provide Excavation and Back Fill for this Equipment and conduits. Site Contractor to provide remaining drainage piping after transition from 5 FT after outlet. Electrical Contractor to provide Control Wiring of Oil

Water Separator. Site Contractor to provide finish grade elevation to Plumbing Contractor for Coordination and shall excavate to the appropriate depth to achieve proper finish grades at the top of the Structure. Site Contractor shall provide Concrete Pad at the Top of Structure aligned with Paving.

- 2. The Site Contractor shall provide all work associated with the Fueling Station as shown on P Drawings including Pads and Bollards. Electrical Contractor providing control wiring for all devices at Fueling Station including Start Up and Commissioning. The Plumbing Contractor shall exclude all work relating to the Fueling Station, and Pads/Bollards for Fueling Station.
- 3. The Plumbing Contractor shall provide the Entire Exterior Domestic and Fire Service Backflow Equipment including Concrete Pad and Heated Enclosure. Outlet for Heated Enclosure to be provided by Electrical Contractor. Bollards to be provided by Site Contractor.
- 4. The Plumbing Contractor shall coordinate with the Owner's Water Utility for connection to the Utility. Plumbing Contractor shall perform all work associated with Labor and Materials for connection to Utility. Excavation and Backfill by Site Contractor.
- 5. The Plumbing Contractor shall coordinate with Owner's Gas Utility for Connection to Utility provided Gas Meter Rig. Pad for Gas Meter Rig shall be provided by the Utility. All Gas Piping, Excavation, and Backfill prior to the Gas Meter Rig shall be provided by Utility, all piping after Gas Meter Rig shall be provided by Plumbing Contractor with Utility Trench Excavation by Site Contractor. Site Contractor to coordinate finish grade elevations and building layout with Utility.
- 6. Trench Drains within in the building on Plumbing Drawings are to be furnished by Plumbing Contractor and turned over to the General Contractor for installation at proper elevation. Plumbing Contractor shall then connect to Trench Drains once set. Plumbing Contractor to coordinate with GC regarding Top of Drain elevations.
- 7. Mechanical Contractor to provide complete HVAC Kitchen Hood System and Ansul System including all Control Wiring and Wall Switch. Electrical Contractor to provide Power and Fire Alarm Connection as indicated on Electrical Drawings. Furnish Emergency Gas Shut Off Valve and turn over to Plumbing Contractor for install. MC to provide Control Wiring to Gas Shut Off for Kitchen Equipment.
- 8. Electrical Contractor to provide Control Wiring for GC provided Overhead/Four-Fold Apparatus Bay Doors and devices (for both Alternate Options). Plumbing Contractor to adjust Layout of Sprinkler Piping at Doors affected by Alternate and include in Base Bid (for both Alternate Options).
- 1.09 CONTRACT C SITE CONSTRUCTION WORK CONTRACT: (ALSO REFERRED TO AS: "SITE CONTRACTOR", "CIVIL CONTRACTOR", "SC", OR "CONTRACTOR RESPONSIBLE FOR SITE WORK")
 - A. The Work of the Site Construction Work Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine ALL drawings and specifications since certain details and/or notes may appear anywhere therein that apply to their work.
 - 1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Site Construction Work.
 - a. Drawings:
 - 1) All "G" Series Drawings (General)
 - 2) All "BS" Series Drawings (Boring for Soils)
 - 3) All "C" Civil Series Drawings Provide all work. Including: V, CD, CS, LS Drawings within Civil Drawing Package.
 - 4) See Electrical and Plumbing Site Drawings for Trench Excavation Locations.
 - 5) See Plumbing Drawings for Fueling Station Drawings.
 - 6) All to be reviewed for typical details and coordination of all work:

- (a) All "A" (Architectural), "S" (Structural), "M" (Mechanical), "E" (Electrical), and "P" (Plumbing) series drawings as it relates to the work of this contract.
- 7) Specifications:
 - (a) Division 0 Procurement and Contracting Requirement, all Sections.
 - (b) Division 1 General Requirements, all Sections.
 - (c) Division 2 Existing Conditions, all Sections. Includes Structure Demolition.
 - (d) Division 3 Concrete as required.
 - (e) Division 5 Metals as required.
 - (f) Division 7 Joint Sealants as required.
 - (g) Division 10 101453 Traffic Signs and 107500 Flag Poles Only.
 - (h) Division 26 Required sections as they relate to this contract for electrical work specifically indicated as required for this contract.
 - (i) Division 31 Earthwork, all sections.
 - (j) Division 32 Site Improvements, all sections.
 - (k) Division 33 Utilities, all sections.
- B. Coordination:
 - 1. Provide Coordination with the work of all other contractors with documented communication to other Prime Contractors. Some specific coordination items include but are not limited to:
 - a. Provide all Coordination Responsibilities per 011315 Coordination between Multiple Prime Contractors.
 - b. Project Master Schedule development assistance and submissions of 2-week look-ahead schedules.
- C. Temporary Facilities
 - 1. Provide Temporary Facility responsibilities indicated in "011200 Multiple Contract Summary: "Temporary Facilities Responsibilities – Designated Responsible Contractors" Section.
 - a. Additional Requirements indicated in "011500 Temporary Facilities and Controls."
- D. Common Site Work Requirements:
 - 1. Provide removal and disposal of miscellaneous materials and equipment including materials not shown if impacting work to be demolished.
 - 2. Provide concrete and asphalt paving, landscaping, site appurtenances, flag poles, concrete bollards, and curbing. The Site Contractor shall perform all necessary excavation, backfilling, compaction, and required concrete.
 - 3. Contractor shall obtain and pay for any permits, inspections, or certifications from governing authorities having jurisdiction over the work to be performed, or over the finished product to be installed by this Contractor.
 - 4. Review Geotechnical Report for existing soil conditions of site.
- E. Identification and Labeling: Provide Labeling of all equipment installed under this Contract.
 - 1. Equipment Labelling shall be sized to be visible from ground level.
 - 2. Provide complete schedules of the following items:
 - a. Equipment Label Schedule with Equipment Model and Serial Numbers.
 - b. Maintenance and Test Interval Schedule of all equipment.
 - c. Replaceable Maintenance Item Schedule with part numbers for all equipment.
 - 1) (Filters, Belts, Seals, Fluids, etc.)
 - (a) Valve Tag / Valve Label Schedule. (Indicate Normal Position (Open or Closed), and Valve Function)
- F. Electrical Wiring of Equipment and Devices:

- 1. Provide all control wiring for equipment and devices installed under this Contract utilizing a licensed Electrician for a fully functioning system except when control wiring is specifically indicated to be provided by the Electrical Contractor on Electrical Drawings.
- G. The Site Contractor is responsible for installation of and maintenance of all Temporary Erosion / wastewater and Sediment Control measure for the duration of the project as specified in Plans and Specifications, "Erosion / waste-water Control."
 - 1. Address erosion control deficiency items within 7 days of notification.
 - 2. Provide written documentation of all Erosion Control Activities including corrective actions.
- H. Electrical Site Work:
 - 1. The following items shall be furnished by Electrical Contractor and turned over to be set by Site Contractor as indicated on Electrical or Civil Drawings: Light Pole Bases, Camera Pole Bases, Electric Manholes or vaults, and Electrical Hand Holes.
- I. Site Plumbing Utility Coordination Storm Drain Piping, Sanitary Piping, and Water Line or Water Service Piping:
 - 1. Plumbing Contractor shall provide Sanitary and Storm Piping indicated on Plumbing Drawings for connection from 5' outside building foundation perimeter.
 - 2. Site Contractor shall provide Sanitary and Storm Piping indicated on Civil Drawings for connection at 5' from outside building foundation perimeter.
 - 3. Plumbing Contractor to provide the entire Water Main Piping Assembly as depicted on Plumbing Drawings. Utility Trench Excavation by Site Contractor.
 - 4. Gas utility to provide new gas service up to gas service meter. Plumbing contractor to provide gas service piping to generator and outdoor pavilion. Utility trench excavation by Utility Company for new service and by Site Contractor for gas service piping to generator and outdoor pavilion.
 - 5. Site Contractor and Plumbing Contractor shall coordinate this work prior to installation.
- J. Site/Civil work Scope Delineation between General Contract (Contract #1) and Site Contractor (Contract #5): Civil/Site Work provided by Site Contractor (Contract #5) indicated below:
 - Site/Civil work "Scope Delineation Areas": The New Building + 5-foot zone from perimeter of foundations of locations are designated as responsible by: General Contractor (Contract #1). All other Site/Civil work outside these areas is designated by Site Contractor (Contract #5).
 - 2. Survey and Layout (per respective designated "Scope Delineation Areas"):
 - a. Provide services of a licensed surveyor to provide layout required for all new work.
 - b. For areas within new building footprints, provide field markings of: new building layout, column line layout, finished floor elevations, and as-built point of reference locations.
 - c. Site Contractor shall provide utility mark out of any existing utilities on site including areas designated as responsibility by General Contractor within "Scope Delineation Areas".
 - d. Provide maintenance of surveyor layout and existing utility markings throughout the duration of the project and restore markings if disturbed during construction.
 - e. Provide surveyed as-built locations and elevations of all underground utilities excavated by this contract, all to be recorded and supplied on CAD and PDF As-Built Drawings.
 - f. Site Demolition: The Site Contractor is to provide all demolition as indicated on Civil Drawings, including within areas designated as responsibility by General Contractor within "Scope Delineation Areas". Including Removing Existing Vegetation, Clearing, Grubbing, Stripping Topsoil, removal of existing above/below grade site features and improvements and backfill after removal, removal of existing utilities and backfill after removal, and all other demolition indicated on Civil Demolition Drawings.
 - g. Site Landscaping: Landscaping, Topsoil, Turfs and Grasses, Plantings, and Restoration shall be provided by the Site Contractor as indicated on Civil Drawings

including within areas designated as responsibility by General Contractor within "Scope Delineation Areas".

- h. Earthwork: The General Contractor or Site Contractor (per their respective designated "Scope Delineation Areas") are to provide all site earthwork, excavation, bedding, backfill, subbase, and base material, including dewatering as required for the installation of work of this Contract:
 - General Excavation: Excavations shall be in comply with current OSHA requirements. Structure Excavation shall be made to the elevations, slopes and limits shown on the plans. Bottom of excavations shall be level and in firm, solid material; where soft or otherwise unsuitable material is encountered, such material shall be removed and replaced with properly compacted earth material, stone or flowable fill, as directed by the Architect. The Contractor is to provide specified backfill as indicated in Specifications.
 - (a) Excavated material suitable for fill or backfill shall be stockpiled on the site to be turned over to Site Contractor for future use. Excess Material shall be properly disposed of by Site Contractor.
 - (b) Dewatering: An adequate dewatering system shall be provided at all structure excavations and elsewhere as required. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress.
 - (1) Excavated areas shall be kept free of water during construction. Where necessary, excavations shall be protected by shoring, sheeting, cofferdams, or other suitable methods. Dewatering shall remain until no longer necessary.
 - (2) The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation.
 - (3) Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage and does not cause damage to any portion of the work or adjacent property.
 - (4) Responsible for permits & testing for discharge off site if needed.
 - (5) All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage.
 - (6) The dewatering system shall be maintained until backfilling is complete.
 - (7) All damages resulting from the dewatering shall be repaired by the Contractor to the satisfaction of the Architect and at no cost to the Owner.
- Utility Trench Excavation: For all underground utilities shown on any Contract Drawings, the General Contractor or Site Contractor (per their respective designated "Scope Delineation Areas") are to provide: Trenching, Excavation, Dewatering, Shoring, Bracing, Concrete Utility Encasement (when specifically indicated), Detectable Marking Tape, and Back Fill for work of all other contractors as indicated on all contract Drawings; Review all contract drawings for all locations requiring Utility Trench Excavation for underground utilities.
- j. Utility Trench Excavation is to be provided for (but not limited to) the following utilities:
 - See 1.4 section G. of 011200 for Typical Utility Trench Excavation Types.
 General Contractor is to provide any foundation footing drains indicated on
 - General Contractor is to provide any foundation footing drains indicated on Architectural Drawings at the foundation, and Site Contractor to provide drain piping from 5 feet outside building perimeter as indicated on Civil Drawings.
- k. Site Concrete:
 - 1) The General Contractor will provide all foundation walls, retaining walls, and staircases (including landings at each end of the staircase) as specifically indicated in Structural Drawings, even if depicted on exterior of building.

Sidewalks or Slabs within these retaining walls, foundation walls, or staircase landings shall be provided by the General Contractor.

- 2) The Site Contractor shall provide the first exterior concrete landing or sidewalk panels outside of all exterior doors to the first exterior expansion or control joint.
 - (a) Expansion Joints between interior and exterior slabs at doorways shall transition under each building exterior door transition or threshold. Caulk Joint to be provided by Site Contractor at Transitions.
 - (b) Site Contractor to provide all concrete stairs, sidewalks, slabs, pads, retaining walls, and other concrete features/concrete work including railings indicated on Civil Drawings that are not specifically indicated to be provided by General Contractor.
 - (c) Provide shop drawings for all concrete/railing work including field measurements and elevations of any existing connection locations prior to installation. General Contractor and Site Contractor shall coordinate concrete transitions prior to performing any concrete work.
 - (d) Each Contractor is to provide their own concrete wash out areas and restoration as required for their own work.
- K. Commissioning:
 - 1. Provide commissioning and startup of all equipment installed under this contract. Submit Documentation for approval prior to equipment acceptance and warranty start date.
- Dwner Training: (all Training to meet requirements of Demonstration Training Specification)
 Provide General Overall Systems Training.
 - 2. Provide all Demonstration and Training Requirements per Specification.
 - 3. In addition to specification requirements, provide Demonstration and Training on the following items upon equipment/system completion and acceptance:
 - a. Underground Utility Layout.
 - b. Sanitary System.
 - c. Storm Drainage System.
 - d. Fueling Station.
- M. Project Specific Requirements:
 - 1. Plumbing Contractor to provide Oil Water Separator and all Accessories, Piping, Vents, Devices, Concrete Deadman's, and Valves as shown on P Drawings and outlet piping 5 Feet from Oil Water Separator. Plumbing Contractor to provide Start Up and Commissioning of System. Site Contractor to provide Excavation and Back Fill for this Equipment and conduits. Site Contractor to provide remaining drainage piping after transition from 5 FT after outlet. Electrical Contractor to provide Control Wiring of Oil Water Separator. Site Contractor to provide finish grade elevation to Plumbing Contractor for Coordination and shall excavate to the appropriate depth to achieve proper finish grades at the top of the Structure. Site Contractor shall provide Concrete Pad at the Top of Structure aligned with Paving.
 - 2. The Site Contractor shall provide all work associated with the Fueling Station as shown on P Drawings including Pads and Bollards. Electrical Contractor providing control wiring for all devices at Fueling Station including Start Up and Commissioning. The Plumbing Contractor shall exclude all work relating to the Fueling Station, and Pads/Bollards for Fueling Station.
 - 3. The Plumbing Contractor shall provide the Entire Exterior Domestic and Fire Service Backflow Equipment including Concrete Pad and Heated Enclosure. Outlet for Heated Enclosure to be provided by Electrical Contractor. Bollards to be provided by Site Contractor.
 - 4. The Plumbing Contractor shall coordinate with the Owner's Water Utility for connection to the Utility. Plumbing Contractor shall perform all work associated with Labor and Materials for connection to Utility. Excavation and Backfill by Site Contractor.

- 5. The Plumbing Contractor shall coordinate with Owner's Gas Utility for Connection to Utility provided Gas Meter Rig. Pad for Gas Meter Rig shall be provided by the Utility. All Gas Piping, Excavation, and Backfill prior to the Gas Meter Rig shall be provided by Utility, all piping after Gas Meter Rig shall be provided by Plumbing Contractor with Utility Trench Excavation by Site Contractor. Site Contractor to coordinate finish grade elevations and building layout with Utility.
- 6. For the Pre-Engineered Wood Frame Building 133400: Site Contractor shall provide Concrete Slab/Pad and all excavations for MEP utilities. General Contractor shall provide all other remaining work including the complete Structure, and any foundation work required.
- 7. Electrical Contractor to provide complete Generator and Load Bank system including Concrete Pad for Generator. Site Contractor to provide grading and subbase for Pad and all Bollards.
- 8. Excess Soil material from Site that cannot be incorporated into the Site to achieve Final Grading Design is to be delivered to material handling facility that is available in close proximity to this site.
 - a. Address: 113 Thiells Mt Ivy Road, Thiells, NY 10984.
 - b. 500 truck load capacity, any excess material must be disposed of by the contractor.

END OF SECTION

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.
- E. Contract requirements related to maintaining Owner's current operations and excess inspection required.
- F. Suggested construction sequence.

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 Contractor shall comply with all state and local requirements for allowable weight limits of vehicles on all roads.
- H. 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.

I. The Contractors shall not close any road for any period in time unless approved ahead of time by appropriate road agency. The Contractors shall take whatever measures are necessary to not cause any inconvenience to the area's residents.

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 allow other Prime Contractors to install their work and complete their contractual obligations in the time period specified.
 - 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 provide temporary handrails, as required, for their work or for work put in place by their Contract that will require temporary handrails. Construction of temporary handrails shall be as specified in Section 015000.
- E. The Contractor shall be responsible for protecting Owner's property. All existing structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment scheduled to remain shall be protected at all times. Any removals or relocation of said objects, if allowed shall be as directed by Owner's Construction Representative.
- F. 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.
- G. Limit use of the site to the areas shown on the Contract Drawings and the adopted Site Utilization Plan. Confine operations to permit others working on the site easy access to all areas of Work.
- H. 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.

- I. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.
- J. It shall be the Site 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.
- K. It is anticpated staging areas shall be relocated several times during the various stages of construction. Additional compensation for relocating staging areas, equipment and material storage, and trailers are not to be considered an extra cost to the Contractor as this is an anticipated expense that shall be considered at the time of the bid.
- L. 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.
- M. 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.
- N. Refer to Section 015000 Temporary Facilities and Controls for minimum rubbish removal requirements.
- O. Do not discard or dispose of any waste on-site.
- P. Open fires will not be permitted on the site.
- Q. The Sitework 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.
- R. Install erosion control measures as indicated in the Contract. The Contractor shall confine stormwater runoff to the site.
- S. The General Contractor and Site Contractor shall be responsible for managing dust as specified in Section 015719 for their respective work.

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. 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.
- C. No materials storage will be permitted within the buildings at any time during construction.
- D. Storage of chemicals and paint materials shall be outside the existing or new structures and shall follow manufacturer's storage/handling guidelines.
- E. 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.

- F. 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.
- G. 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.
- H. 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.
- I. 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 7:30 am - 3:30 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.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED END OF SECTION

1.01 SECTION INCLUDES

- A. Allowance pricing for the following items:
 - 1. Contingency Account.
 - 2. Allowances listed on PB Proposal Sheets
- 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. Eligible costs described in this Section, and Sections referenced herein, will be the only costs paid for out of the stipulated allowances.
- D. All other costs associated with the project as specified and/or shown, including but not limited to the delivery, installation and all Contractor overhead/profit, insurnaces 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 CHANGES TO STIPULATED (CASH) ALLOWANCE

1.04 PAYMENTS TO BE MADE OUT OF CONTINGENCY ACCOUNT

- A. Include the cash allowance amount indicated in the proposal for use upon the Owner's instructions for additional improvements beyond those identified in the contract documents and for unforeseen conditions.
- 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

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

1.01 SECTION INCLUDES

- A. This Section includes the requirements for substitution of specified products during construction.
- B. The Architect/Engineer will consider requests for substitutions only within <u>thirty (30)</u> days from the date of the Notice to Proceed.
- C. Only products not specifically named in the bid are eligible for substitution in accordance with the requirements contained herein these specifications.
- D. 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. <u>Name</u> 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. <u>Equals</u> 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 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.

- 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. <u>Substitution Submittal Procedure:</u>
 - 1. The Contractor shall submit three (3) copies of the <u>REQUEST FOR SUBSTITUTION</u> <u>FORM</u> for consideration including all required information.
 - 2. The Contractor shall use the form included within this Section.
 - 3. All forms shall be type written.
 - 4. 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.

PART 3 - EXECUTION

NOT USED

This space left intentionally blank.

REQUEST FOR SUBSTITUTION FORM

| Project: <u>TRFD2302 Thiells New Fire</u> <u>Headquarters</u> | Substitution Request Number: |
|--|---|
| Contractor: | |
| Address: | |
| То: | Date: |
| H2M Project Number: <u>TRFD2302</u> | Owner: Thiells-Roseville Fire District (TRFD) |
| 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 product2-5 years old | 5-10 years oldMore 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:NoYes | | |
| Explain: | | |
| Gross Savings to Owner for accepting substitution: \$ | | |
| Proposed substitution changes Contract Time:NoYes | | |
| Add / deduct (circle): days | | |
| Supporting data attached for evaluation of the proposed substitution: | | |
| Product DataPhotosDrawingsTestsReportsSamples | | |
| 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:_____

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections apply to this Section.
- B. Allowance Specification Section.
- C. Payment Procedures Specification Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
 - 1. The provisions of this section apply to the work of each Prime Contract.
- 1.03 MINOR CHANGES IN THE WORK
 - A. The Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, as an "Architect's Supplemental Instruction" or "Architect Clarification".

1.04 POTENTIAL CHANGE ORDER PROCEDURES

- A. No additional work to be performed without written approval of costs or written direction to proceed per Time and Material Procedures: The Prime Contractor shall not under any circumstances, perform any work outside the contract sum that incurs additional costs without notifying the Architect and Construction Manager and receiving corresponding written directive to proceed with the presumed additional work. Any additional costs for work that was performed without a written directive to proceed will not be processed. This includes costs included in the Base Bid for Unit Price Quantities.
- B. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider a proposal request as instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 7 calendar days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
- C. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a Potential Change Order Proposal.
- D. Potential Change Order Proposal Documentation Requirements (for Owner-Initiated Proposal Request responses or Contractor-Initiated Proposals:)
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change along with potential equipment and material lead time. Indicate the effect of the proposed change on the Contract Sum and the Contract Time. Indicate equipment and material delivery lead time information.
 - 2. Include the following supporting documentation with each Potential Change Order Proposal:
 - a. Labor cost data: Provide labor, quantity.

1)

- Group Labor hours by specific tasks for each portion of the referenced work to justify labor hour quantity.
- 3) Provide calculations, supporting documentation, and prevailing wage back up to determine all cost components of the hourly labor rate for each labor classification.
- 4) Additional Contractor Supervision may not be charged if supervision is already scheduled for Contract Work.
- 5) Overtime, nightshift, or premium labor rates shall not be charged unless mandatory.
- b. Material cost data: Include a list of quantities of products required or eliminated and unit costs. Provide quotations from vendors for all material costs.
- c. Equipment cost data: Provide Equipment costs for both owned (in accordance with Blue Book rates) or rented (per the actual invoice) for hours associated with referenced work.
- d. Proposals from subcontractors shall be itemized with the same level of detail for Labor, Materials, and Equipment, with no overhead and profit included in initial cost data. Subtotal of net costs to be provided. See "Overhead and Profit (OH&P)" for subcontractor Overhead and Profit procedures.
- e. Include copies of any issued Proposal Requests, Clarifications, emails, related drawings, sketches, and photographs associated with the reference work with Potential Change Order.
- f. All costs for these components shall be calculated at net costs without Overhead and Profit included.
- g. Provide a subtotal of all net costs without any Overhead and Profit, or Bonding costs included.
- h. Provide a Grand Total of Costs for the Potential Change Order with Prime and Subcontractor Overhead and Profit and Bonding costs included. See General Conditions for additional Bonding cost procedures.
- 3. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- 4. All Contractor Submitted Potential Change Order Proposals shall be presumed to include work that is compliant with the Contract Documents, Details, Specifications, General Conditions, and as defined on Proposal Requests unless specifically noted otherwise. Deviations from requirements shall be clearly and specifically indicated as exclusions which must be specifically acknowledged during the review process.
- 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- E. Overhead and Profit (OH&P): A Prime Contractor and their subcontractor(s) will be authorized to include overhead, and profit applied to Change Order work as follows:
 - Additional Work self-performed by a Prime Contractor will be allowed a maximum of 15% combined OH&P on sub-totaled net cost of additional work. The 15% combined OH&P includes Subcontractors Overhead and Profit (10% OH&P for Subcontractors and 5% OH&P on Subcontractor's net costs for Prime Contractor.
 - 2. See Allowance Specification for Prime Contractor and Subcontractor Overhead and Profit procedures for Potential Change Orders processed as Allowance Authorizations.
 - 3. Additional Work performed by subcontractors or multiple-tier subcontractors under a Prime Contractor will be allowed a total maximum of:
 - a. Subcontractor allowed 10% OH&P on net cost of additional work.
 - b. Additional 5% OH&P allowed for the Prime Contractor on the net cost of subcontractor's cost.

- c. Combined maximum of 15% total for Overhead and Profit.
- 4. When the Contract Sum is being adjusted with a combination of additional and deduct costs, the additional overhead and profit is to be applied to the final net increase costs only.
- 5. Additional Bond Costs to only apply to final net increase costs only.
- F. Time and Material Procedures: When a price has not been mutually agreed upon between the Contractor and the Owner/Construction Manager/Architect for the cost of additional work or cost of disputed contract work has not currently accepted and work must proceed to maintain schedule, the Construction Manager/Architect may direct work to proceed and be tracked on daily Time and Material Tickets witnessed by the Construction Manager, and Contractor provided Time and Material Tickets for Construction Manager Signature.
 - 1. The Prime Contractor shall be responsible to provide 48 Hour notification of all Time and Material work and the Construction Manager must be present to witness the Time and Material work and provide signature of Contractor's Time and Material Tickets.
 - 2. At the end of each day, the contractor shall provide a daily Time and Material Ticket indicating the date, description of work and quantities of labor, materials, and equipment used to perform the work, and present for daily signature by the Construction Manager. Utilize Carbon Copy physical tickets to provide copies to the Construction Manager for record.
 - 3. The owner or their representatives reserves the right to establish the quantity of work in place by independent quantity survey, measures, or counts.
 - 4. The Construction Manager may require the Contractor to provide a Maximum Not-to-Exceed Proposal cost prior to authorizing work to be performed via Time and Material Procedures. Upon completion and of additional work, the Potential Change Order Proposal shall be processed at costs per the actual quantities utilize but shall not be processed for a cost greater than the Maximum Not-To-Exceed Proposal Cost.
 - 5. The Construction Manager's signature on any Time and Material Tickets will be used for verification of quantities only and does not verify or confirm that the Labor, Materials, or Equipment costs were required for work being performed. The Construction Manager's Signature on any Time and Material ticket shall not be construed as:
 - a. Agreement that items and costs listed on the ticket represent additional Work or a change in the Scope of Work;
 - b. Agreement that the Contractor shall be compensated for the items and costs listed on the ticket; or
 - c. Agreement that the Construction Manager shall issue and approve a Change Order for the items and costs listed on the ticket.

1.05 CONTINGENCY ALLOWANCE

A. When a Contingency Allowance is included in the Contractor's base bid, the Construction Manager/Architect will determine if a Potential Change Order Proposal will be processed as either a Change Order or an Allowance Authorization utilizing the Contractors Contingency Allowance.

1.06 UNIT PRICE PROCEDURES

A. When a Unit Price Quantity is included in the Contractor's base bid, the Contractor shall submit a Unit Price Quantity Proposal indicated the anticipated quantity required to support the work of the Contractor. When the Unit Price Quantity Proposal is accepted and a written direction to proceed has been given, Time and Material Procedures shall be followed to determine the actual quantity utilized for the work performed. Once Time and Material Procedures have been completed, submit a revised Proposal that includes the actual quantities installed.

H2M

1.07 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Construction Manager/Architect will issue a Change Order for signatures of Architect, Construction Manager, Owner, and Contractor on the Change Order form.

1.08 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change via an email, letter, or document similar to AIA Document G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates a method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Prime Contractor Documentation: The Contractor is to maintain detailed records on a per Time and Material Procedures for work required by Construction Change Directive or direction to Proceed via Time and Material Procedures.
 - 1. After completion of change, submit Time and Material Documentation with Potential Change Order, to substantiate cost and time adjustments to the Contract.

1.09 BACK CHARGES

- A. The Owner reserves the right to back charge a Contractor, via a Deductive Change Order, for the cost of total and complete remedy due to the failure of Contractor to comply with any provision(s) of the Contract Documents.
 - 1. Contractor Signature of Deductive Change Order for Back Charges is not required. Deductive Change Order for Back Charges are to be considered executed to be once signed by Owner, Architect, and Construction Manager.
 - 2. Deductive Change Orders for Back Charges are to be listed on subsequent Applications for Payment once issued.
 - 3. If a Back Charge Deductive Change Order remains in dispute by the Contractor, then the Contractor shall follow claim procedures in General Conditions of Contract.

1.10 CREDITS FOR ALTERNATES RECINDED POST AWARD

- A. Alternates that were accepted during Contract Award may be rescinded after the Contract is awarded via deduct change order. If no work has been performed or materials provided, then the Total Cost of the Alternate shall be returned including any Overhead and Profit that was included with the associated Alternate being rescinded.
 - 1. If a portion of the Alternate has been completed, then the Contractor will be entitled to payment of the costs associated with the portion that has been completed including a equitable portion of Overhead and Profit for the completed work.

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.
 - 2. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
 - 3. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submission of Contractor's Construction Schedule and Submittal Schedule.
 - 5. Schedule of Values Sample Form.
 - 6. Subcontractor Billing Summary Sheet Sample Form.
 - 7. Project Specified Partial and Final Lien Waiver Forms.

1.02 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.03 SCHEDULE OF VALUES

- A. Schedule of Values Review Process:
 - 1. Submit the Schedule of Values to the Construction Manager at earliest possible date but no later than fourteen (14) days before the date scheduled for submittal of draft initial Application for Payment.
 - 2. If Schedule of Values is returned to the Contractor as "Revise and Resubmit" for failing to meet requirements stated within this section, then the review period shall be extended by another 14 days from the date of every resubmission of the Schedule of Values.
 - 3. Schedule of Values is to be resubmitted as many times as necessary until the Schedule of Values complies with all requirements of this section as identified in responses from the Construction Manager and Architect.
 - 4. The Schedule of Values approval shall not be utilized to determine exact cost of work or materials when calculating the costs used for processing add or deduct change orders for Changes in Work. The Construction Manager and Architect reserve the right to reevaluate all costs referenced from Schedule of Values when associated with a change prior to the cost for Changes in Work being accepted.
- B. Schedule of Values Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum including any Back-Charge Deduct Change Orders issued by the Owner.
- C. Schedule of Values Format and Content: Use the Project Manual Table of Contents as a guide to establish line items for the Schedule of Values.
 - 1. Utilize "Schedule of Values" Blank form supplied with Project Manual. Submit Schedule of Values Submittal as Microsoft Excel file and PDF Submittal with a Submittal Coversheet.
 - 2. Provide line-item breakdown of Contract Sum in enough detail to facilitate continued evaluation of Applications for Payments as directed by Construction Manager or Architect.

3.

- Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
- Provide at least one line item for each Specification Section. When applicable, divide costs into further detailed line items as directed by Construction Manager or Architect.
- 5. All rows need to be fully populated with data from first row to last row. No blank rows to exist between any populated rows.
- 6. Costs in "Amount" column needs to be formatted to "Number" Cell Type in Excel.
- 7. Character limit of Schedule of Value Descriptions is 64 Characters, abbreviate descriptions as needed.
- 8. Multiple Buildings: When Contract Work includes work located in multiple buildings, divide Schedule of Values line items in separate groups for each building. Include building prefixes on all building line-item descriptions.
- 9. Scheduling Phases: Where the work is separated into multiple schedule phases requiring separately phased payments, provide breakdown of Schedule of Values showing values correlated with each phase as indicated on Contract Schedule. Include prefixes on all Scheduling Phase line-item descriptions.
- 10. Include Alternates as separate items. Group items associated with Alternates by Alternate and list after Base Bid Work. Include prefixes on all alternate line-item descriptions.
- 11. All Line Item "Descriptions" need to be unique and may not match another line-item description.
 - a. Locations, Alternates, and Scheduling Phases are to be identified uniquely within each description of each item when Locations, Alternates, or Scheduling Phases are used.
 - b. Line-Item Numbers are not required to be entered in "Description" as they will be applied automatically.
- 12. Separate Sections of Schedule of Values by Drawing Area and Floor Level.
 - a. In the description, include a location tag/prefix in the text of each work item.
 - b. Separate line items by Labor and Material.
 - c. Include a "-" in between each description prefix or identifier.
 - d. Examples:
 - 1) "HS-FL1-A-Piping Install-L" = High School Floor 1 Area A Piping Install Labor.
 - 2) "ES-LL-D-Hardware-M" = Elementary School Lower-Level Area D Hardware Material.
 - 3) "HS Insurance" = High School Insurance.
- 13. No \$0['] Amount "Separation" Line items are to be listed except for the following items:
 - a. Buildings: Provide Building Prefix Tag in descriptions of all line items under each building.
 - b. Add "SED" State Education Department Number in Building Descriptions when applicable.
 - c. Alternates: Provide Alternate Prefix Tag in descriptions of all line items under each Alternate.
 - d. See below for Allowance, Unit Prices, and Change Order items.
 - e. No other rows may be permitted to have \$0 in "amount" column.
- 14. Provide the following line items at the end of the Schedule of Values:
 - a. "Remaining Balance of Allowance ("Input Original Allowance Amount") (Do not Bill)"
 - 1) Amount to be set to "\$0".
 - 2) To be listed at end of Schedule of Values, before "Change Orders Below".
 - 3) Use only when there are Allowances used on Project.
 - 4) Substitute "Allowance" for "Unit Price" when there are Unit Prices are included on Project.
 - 5) Indicate Allowance or Unit Price Identification Number when applicable.
 - b. "Change Orders Below"
 - 1) Amount to be set to \$0.
 - 2) To be listed as last item on Schedule of Values.

- D. List of Required General Condition Line Items to be included with Schedule of Values. Divide General Conditions line items between multiple buildings when required.
 - 1. Insurance Actual Invoice Amount.
 - 2. Bonds Actual Invoice Amount.
 - 3. Mobilization Actual Value of Mobilization Amount but not to exceed 1.5% of Contract Sum.
 - 4. Temporary Facilities and Controls Divide costs into sub line items as required for specific Temporary Facilities Responsibilities.
 - 5. Submittal Schedule Minimum of 0.25% of Contract Sum.
 - 6. Submittals Minimum of 1% of Contract Sum.
 - a. Not to be billed until Submittal Schedule has been approved and copy of the approved Submittal Schedule (which is to be marked up with Submittal Submission Progress) is included with the Draft Application for Payment.
 - 1) Schedule Minimum of 1% of Contract Sum.
 - (a) Initial Project Schedule (25% of Schedule)
 - (1) Monthly Updated Schedules (50% of Schedule)
 - (2) Two Week Look Ahead Schedules (25% of Schedule)
 - (b) Field Supervision Minimum of 3% of Contract Sum.
 - (c) Meetings Minimum of 1% of Contract Sum.
 - (d) Safety and Field Reports Minimum of 1% of Contract Sum
 - (1) Weekly Safety Meeting Documentation required to be submitted with each Application for Payment.
 - (e) Coordination Drawings, Modeling, and Layout Minimum of 1% of Contract Sum.
 - (f) HVAC Testing and Balancing: TAB (if TAB is included in Contract) Minimum of 1% of Contract Sum.
 - (1) Pre-TAB activities (20% of TAB)
 - (2) TAB Activities (40% of TAB)
 - (3) Final Tab Reports. (40% of TAB)
 - (g) Equipment Start Up and Commissioning Minimum of 1% of Contract Sum.
 (1) Divide costs into sub line items as required for different equipment.
 - (h) Punchlist Minimum of 2% of Contract Sum
 - (1) Not to be billed until the Substantial Completion Inspection Report is issued and Punchlist Work is being completed.
 - (i) Final Demobilization
 - (j) Final Cleaning (separated by phase if applicable).
 - (k) Project Closeout Total Value not to be less than 2% of Contract Sum.
 - (1) Closeout Document Table of Contents.
 - (2) Operation and Maintenance Package.
 - (3) Maintenance Material and Attic Stock Transmittals.
 - (4) Demonstration and Training Documentation.
 - (5) Warranty Package.
 - (6) Project Record Document Package.
 - (7) Physical Closeout Document Turn Over.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Construction Manager, Architect and paid for by Owner.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

- B. Payment-Application Times: The date for each progress payment is the 20th day of each month (or as designated by the Owner). The period covered by each Application for Payment is to the last day of the month of the current billing period.
- C. Payment-Application Forms: Use forms similar to AIA Document G702cma and AIA Document G703 Continuation Sheets as the form for Application for Payment.
- D. Draft Application for Payment Preparation:
 - 1. Include with each Draft Application for Payment:
 - a. Submittal Schedule for Submittal Progress Billing: When Submittal Line items are being billed, the Contractor shall include a copy of the approved Submittal Schedule updated by Contractor with Submittal Submission Progress.
 - 1) Contractor's failure to include the updated Submittal Schedule will result in no billing allowed for any Submittal Line Items.
 - b. Projected Work Schedule: When work is projected to be scheduled between the date of Draft Application Submission to the end of the Billing Period, the Contractor shall include a detailed schedule of the activities that are scheduled to occur prior to the end of the billing period. Schedule shall include reference to Schedule of Value Line-item numbers.
 - Contractor's failure to include this Projected Work Schedule will result in line-item adjustments to be made in accordance with work in place as of the date of submission of the Draft Application for Payment with no future projected work to be included.
 - 2) Contractor's failure to perform projected work by the end of the billing period may result in a rejection of the Signed Application for Payment resulting in the requirement for a revised Application for Payment to be resubmitted and reviewed prior to acceptance.
 - c. Stored Material Documentation: When Stored Material is being billed, the Contractor shall provide required Stored Material Documentation.
 - d. List of Subcontractors who performed work onsite or scheduled for the current billing period.
- E. Signed and Notarized Application for Payment Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values.
 - 2. Include amounts for work completed following previous Application for Payment, regardless of if payment has been received from the previous Application for Payment.
 - 3. Include amounts of fully executed Change Orders, Allowance Authorizations, and Construction Change Directives issued prior to the last day of the construction period covered by the application.
 - 4. Include as a singular combined .PDF attachment with each Signed and notarized Application for Payment Cover sheet, the following documents in the order shown below:
 - a. Updated Contractor Project Schedule with (Projected Work Schedule).
 - b. Updated Submittal Schedule with Status of Submittals.
 - c. Stored Materials Documentation.
 - d. Prime Contractor Lien Waiver on Specified Lien Waiver Form.
 - e. Prime Contractor Certified Payroll Documentation.
 - f. Subcontractor Billing Summary Sheet.
 - g. Subcontractor/Supplier Lien Waivers on Specified Lien Waiver Form.
 - h. Subcontractor Certified Payroll Documentation.
 - i. Copies of the approved Allowance Authorization Forms or Change Order Forms.

- F. Transmittal: Submit signed and notarized copies of each Application for Payment to the Construction Manager by an electronic method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.
- G. Review of Application for Payment:
 - 1. Applications for Payment may be rejected with no action taken if required documentation as identifying within this specification is not included with Application for Payment submission. Applications for Payment may also be rejected if requested line-item percentages are significantly incorrect with respect to the work that is completed at the date of submission.
 - 2. Upon discovery and uncovering of either deficient work or incomplete work, line items paid in previous Applications for Payments may be reevaluated and adjusted to account for the cost to complete remaining work or correct deficient work. This adjustment may result in a negative value entered into the "Work Completed This Period" (Column E) for the associated Schedule of Values line item to reflect the actual cost withheld to complete or correct remaining work.
 - 3. The Issuance of a Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the work, (2) reviewed the Contractor's construction means, methods, techniques, sequences, or procedures, (3) reviewed copies of requisitions received from Subcontractors and material 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.
- H. Subcontractor Billing Summary Sheet: Provide with each Application for Payment a copy of the completed Subcontractor Billing Summary Sheet form as specified, listing each Subcontractor and Supplied that has supplied or performed work or is scheduled to perform work on the Project. The Contractor shall provide on the Subcontractor Billing Summary Sheet:
 - 1. List of all Subcontractors and Suppliers including their Subcontract amounts and documentation that the aggregate sum of the remaining balances owed to Subcontractors and Suppliers does not exceed the remaining balance owed to the Prime Contractor for the current billing period.
 - 2. Indicate whether the Subcontractor and Suppliers worked onsite in the previous billing period and current billing period.
 - 3. Include each Subcontractor's and Supplier's Contract Amount, Sum of Payments previously received, current amount requested this period, and balance to finish of Subcontractor/Supplier Contract Sum.
 - 4. Indicate whether Subcontractor Lien Waiver Documents and Certified Payroll Documentation is included with the attached Documents.
 - 5. Lien Waiver Documents and Certified Payroll to be attached to the PDF Attachment included with the Signed Application for Payment.
 - 6. Prime Contractor to sign and certify that all information of Subcontractor Billing Summary sheet is correct.
- I. Lien Waivers: With each Application for Payment after the first, submit Lien Waivers from subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.
 - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
 - 2. When an application shows completion of an item or retainage is partially released for items that are complete, submit Final Notarized Lien Waivers on specified form confirming that final payment has been made to the associated Subcontractor or Supplier.

- 3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - a. Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
- 4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner. Utilize specified Lien Waiver forms provided by Construction Manager.
- 5. Waiver Form Content: Each Lien Waiver shall include the following information from each subcontractor, sub-subcontractor, or supplier:
 - a. Original Contract Sum.
 - b. Total amount Paid to Date.
 - c. Balance to Finish.
 - d. List of Disputed Claims.
 - e. Dated Signature by subcontractor, sub-subcontractor, or supplier.
- J. Certified Payroll: Provide copies of certified payrolls (including subcontractors) that are signed and notarized, documenting compliance with prevailing wage laws.
 - In accordance with Article 8, Section 220 of the New York State Labor Law, every contractor, and subcontractor must keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three years from project's date of completion. At a minimum, payrolls must show the following information for each person employed on a public work project:
 - a. Name.
 - b. Classification(s) in which worker was employed.
 - c. Hourly wage rate(s) paid.
 - d. Supplements paid or provided.
 - e. Daily and weekly number of hours worked in each classification.
 - 2. Every contractor and subcontractor shall submit, within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payroll, subscribed and affirmed as true under penalty of perjury.
- K. Stored Material Documentation:
 - 1. When stored material is being billed, the Contractor shall provide the following:
 - a. Copies of paid invoices for stored materials. Invoices shall indicate Schedule of Values line-item numbers crossed reference to the values of the invoices. Do not include Overhead and Profit on Stored Materials. Retainage shall still be withheld from Stored Material.
 - 1) When a stored material invoice cost applies to multiple Schedule of Values line-items, show cost distributions calculations between each line item.
 - 2) When multiple stored material invoices apply to an individual schedule of values line-item, show cost distribution calculations between each invoice.
 - b. Certificate of Insurance to be provided to cover the Total Amount of presently stored materials (Total of Column F: Material Presently Stored).
 - 1) Certificate of Insurance shall indicate stored material invoices, invoices numbers and total costs covered by the insurance.
 - 2) If additional stored material is billed when existing material is already presently stored, update Certificate of Insurance to include the total amount of presently stored material (Total of Column F: Materials Presently Stored).
 - c. Transfer of Title agreement to Owner for Stored Materials with Contractor Acknowledgement of Contractor to remain responsible for all Contractual requirements including protection of stored materials, complete installation, and providing all warranties.
 - d. Photographs of Stored Material. Label Stored Materials in photos to be clearly identified and cross reference to the Invoices.
 - 2. Stored Material Billing Procedure:

- a. Enter in column F (Materials Presently Stored) the value of the materials presently stored for which payment is sought. Recalculate the total of the column 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. 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 b. column and incorporated into Column E (Work Completed this period).
- Material Not Stored Onsite: When a significant value material line item is requested to be 3. billed, vendor or supplier material invoices may be requested by Construction Manager/Architect to be supplied by the Contractor (regardless of if the material is considered Stored Material) to verify costs of material line items on Schedule of Values even after previous approval of Schedule of Values. Invoices may be requested to be supplied for materials stored onsite and required for materials stored offsite.
- 1.05 INITIAL APPLICATION FOR PAYMENT, APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION, AND FINAL APPLICATION FOR PAYMENT
 - A. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal for the initial Application for Payment include the following. The initial payment application will not be processed until all of these actions and submittals have been received by the Construction Manager.
 - Approved Schedule of Values. 1.
 - 2. Executed Contract.
 - 3. Approved Insurance Document Package.
 - Approved Performance and Payment Bonds. 4.
 - 5. Contractor's W9 Document.
 - 6. Approved Site-Specific Safety Plan.
 - Employee List with associated OSHA Cards. 7.
 - Approved List of Subcontractors and Suppliers (Including any qualification Documents 8. required).
 - Contractor's Construction Project Schedule. 9.
 - 10. Contractor's Submittal Schedule (Including list of Closeout Submittals).
 - B. Application for Payment at Substantial Completion: Following assurance of the Certificate of Substantial Completion: Administrative actions and submittals, that must precede or coincide with submittal for the Application for Payment at Substantial Completion include the following. The initial payment application will not be processed until all of these actions, submittals, and documentation of these procedures being completed have been submitted by the Contractor:
 - 1. Fully Executed Certificate of Substantial Completion Issued by the Architect or Owner and Signed by the Contractor.
 - 2 Consent of Surety G707A when a reduction of retainage is requested.
 - Provide Documentation of completion of required procedures as indicated in "017700 -3. Closeout Procedures." For Substantial Completion.
 - 4. Submit copy of Construction Manager and Architect's Substantial Completion Inspection List of Items to be completed or corrected. Supporting documents include Observation Report Action items, Construction Deficiency Report items, and any other issued Punchlist items.
 - The Contractor is to provide cost estimates for a 3rd party Contractor to complete or a. correct remaining incomplete work for each individual item.
 - Item identified as "generally incomplete" without specific locations identified are to be b. inspected by Contractor, and Contractor is to provide a detailed itemized list of locations that are considered incomplete. Without itemized list of incomplete locations, all locations will be considered incomplete until documentation is supplied that confirms otherwise.

- c. At the time of Substantial Completion, a value of 2 times the cost for a 3rd Party Contractor to finish remaining incomplete work items shall be withheld until the incomplete work has been completed and accepted.
- d. The Contractor proposed values for the incomplete work shall be adjusted at the discretion of the Construction Manager and Architect to determine the final amount withheld for the incomplete work.
- C. Final Payment Application: Administrative actions and submittals that must be included with submittal of the final Application for Payment include the following:
 - 1. Evidence of completion of Project Closeout Requirements.
 - a. Include Transmittals of Physical Closeout Documents turn over to the Owner with approved Submittal Coversheet for Physical Closeout Documents.
 - b. Transmittal for Project Record Document Package Turnover with approved Submittal Coversheet for Project Record Document Package.
 - c. Transmittal for Operation and Maintenance Data Package Turnover with approved Submittal Coversheet for Operation and Maintenance Data Package.
 - d. Transmittal Warranty Package Turnover with approved Submittal Coversheet for Warranty Package.
 - 2. Evidence of completion of all Substantial Completion Inspection Report items, Construction Deficiency Report item corrections, Observation Report Action Items, and all other issued Punchlist Items.
 - a. Include detailed descriptions of corrective actions taken by Contractor for each item including the date of completion of each item.
 - b. Include written evidence of acceptance of corrective actions by Architect or Construction Manager.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements. Warranty Coverage shall be extended to cover Contractor Warranty period.
 - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 6. AIA Document G707, "Consent of Surety to Final Payment."
 - 7. Evidence that claims have been settled.
 - 8. Contractor's No Asbestos Certification Letter

1.06 CONSTRUCTION DEFICIENCY REPORTS

- A. Upon discovery of deficient or improperly installed work, or damage due to construction, the Architect or Construction Manager may issue a Construction Deficiency Report. The Contractor shall calculate a complete cost to correct deficient work (including removal of deficient work to allow for correction) by 3rd Party Contractor and is to be submitted by the Contractor, which shall be reviewed and adjusted by the Construction Manager and Architect.
- B. A value of 2 times the cost for a 3rd Party Contractor to replace deficient work shall be withheld from the Contractor as of the issued date the Construction Deficiency Report and held until the deficient work has been completed and accepted.

1.07 RIGHT TO CURE

A. If the Contractor refuses or fails to supply enough properly skilled workers; proper materials; maintain the Construction Schedule, as amended by the Construction Manager from time to time; make prompt payment for its workers, subcontractors, sub-subcontractors or suppliers; comply with laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or otherwise fails to comply with any provision of the Contract Documents, and fails to commence and maintain satisfactory correction of such default with diligence and promptness, within three (3) Business Days after receipt of written notice from the Construction Manager, then the Owner, without prejudice to any other rights or remedies, shall have the right to any or all of the following remedies:

- 1. Supply such number of workers and quantity of materials, equipment and other facilities as the Construction Manager deems necessary for the completion of the Contractors Work, or any part thereof, which the Contractor has failed to complete or perform after the aforesaid notice, and charge the cost thereof to the Contractor, who shall be liable for the payment of same including reasonable markup as allowed by this Agreement.
- 2. Contract with one or more additional Contractors or use its own forces to perform such part of the Contractor's Work as the Construction Manager shall determine will provide the most expeditious completion of the total Work and charge the costs thereof to the Contractor.
- 3. Withhold payment of any moneys due the Contractor, pending corrective action to the extent required by and to the satisfaction of the Construction Manager and the Owner.
- 4. Charge the Contractor for all costs incurred by the Owner due to its failure to comply, delay or breach, including but not limited to, markup as allowed by this agreement, Construction Manager's Fees, Architect's Fees, attorney's fees, and additional actual expenses incurred for supervision, equipment rental, contract solicitation, and the like.
- 5. In the event of any emergency affecting the health or safety of persons or property, the Construction Manager may proceed as above without notice.

1.08 BACK CHARGES

- A. The Owner reserves the right to back charge a Contractor, via a Deductive Change Order, for the cost of total and complete remedy due to the failure of Contractor to comply with any provision(s) of the Contract Documents.
 - 1. Contractor Signature of Deductive Change Order for Back Charges is not required. Deductive Change Order for Back Charges are to be considered executed to be once signed by Owner, Architect, and Construction Manager.
 - 2. Deductive Change Orders for Back Charges are to be listed on subsequent Applications for Payment once issued.
 - 3. If a Back Charge Deductive Change Order remains in dispute by the Contractor, then the Contractor shall follow claim procedures in General Conditions of Contract.
- PART 2 PRODUCTS (NOT USED)
- PART 3 EXECUTION (NOT USED)
- **END OF SECTION**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes:
 - 1. Requests for Interpretation or for information
 - 2. Coordination between contractors, if applicable
 - 3. Administration of subcontracts
 - 4. Coordination of work with other Contractors, utility companies, and the Owner/Architect/Engineer
 - 5. Communication and coordination requirements
 - 6. Qualifications of Contractor's job site superintendent
- 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. The Architect/Engineer will respond in writing to the request as soon as possible.

1.03 COORDINATION BETWEEN CONTRACTORS

- A. Each Contractor shall fully cooperate with each other Contractor(s) and carefully fit its own work to that provided under other contracts as shown or specified in the Contract Documents and as may be coordinated by the Owner/Architect/Construction Manager
- B. Each Contractor shall not commit or permit any act that will interfere with the timely performance of work by any other Contractor.
- C. The Contractor shall conduct his/her own operations, and to cooperate with such other parties, so as to cause as little interference as possible with the work by others.
- D. The Contractor agrees to make no claim against the Owner/Architect/Engineer/Construction Manager for additional payment due to delays or other conditions created by the operation of others.
- E. If any portion of the work of the Contractor, or any of his/her subcontractors, depends upon the proper execution of the work by others, the Contractor shall promptly give written notice to the Architect/Engineer/Construction Manager of all purported defects in the installed work as renders it unsuitable for proper execution and completion of his/her own work. The Contractor shall further notify the Architect/Engineer/Construction Manager of all supposed delays, in the performance of his/her work, as will affect the timely performance of his/her own work or the project.

- F. The Contractor's lack of notice shall constitute an acceptance by him/her that the work of others is fit and proper for the reception of the Contractor's own work, except as to defects developing in the work that could not have been reasonably foreseen.
- G. If the Owner/Architect/Engineer/Construction Manager determines that the Contractor is failing to coordinate his/her own work with the work of others, then the Owner shall have the right to enforce the provisions of the Contract as related to non-performance.
- H. The Owner/Architect/Engineer/Construction Manager shall not be liable for any damages suffered by this Contractor by reason of any other Contractor's failure to comply with the directions so issued by the Owner/Architect/Engineer/Cosntruction Manager, or by reason of another Contractor's default in performance; it being understood that the Owner does not guarantee the continued efficiency or work production of any Contractor and by execution of the Contract, the Contractor fully understood the potential coordination problems associated with projects involving multiple prime construction contracts.
- I. The Contractor's attention is specifically directed to the fact that he/she may not have exclusive occupancy of the work area within the limits of the Contract. Each Contractor shall afford the Owner, other Contractors, and utilities reasonable opportunity for the storage of their materials and equipment, and the execution of their work, and shall connect and coordinate his/her work with theirs as required by the Contract Documents.

1.04 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. Each 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.
- E. The Contractor's on-site project superintendent shall inspect all the work of all of his/her subcontractors, as it is being constructed. The Contractor's subcontractor shall not be permitted to do any work on the site without the Contractor's job site superintendent also being there to inspect the work as it is being performed.

1.05 UTILITY COORDINATION

- A. Comply with the requirements of 16 NYCRR Part 753 Protection of Underground Facilities. Submit a letter stating the case number.
- B. Comply with the utility coordination requirements contained in the General Conditions.

1.06 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.

1.07 SPECIFIC COORDINATION REQUIREMENTS

- A. Coordinate the work by complying with the following:
 - 1. Email Account: Each Contractor shall maintain an email account that shall be used to improve communication. An email shall not constitute a formal advisement regarding the terms and conditions of the contract. Email shall only be considered an informal way of notifying relevant parties of project related activities.
 - 2. Email List: Each Contractor, within five (5) calendar days from the Notice To Proceed, provide a list of email addresses for each major equipment supplier and local representative, if such exists. A contact person shall be provided for each email address.
- B. The Contractor shall sequence and schedule work so as not to interfere with the work by others and to afford each Contractor the time to complete their contractual obligations with the Owner. Coordinate the work of this Contract with the work by others. Coordination includes, but is not limited to, the following:
 - 1. Each prime Contractor shall provide the Architect/Engineer/Construction Manager with a list of shop drawings that they may require to properly coordinate the work. If a list is not provided to the Engineer within fifteen (15) calendar days from the date of the Notice to Proceed, then it shall be taken that shop drawings of other prime Contractors are not required. Each prime Contractor shall be responsible for providing the list within the time specified.
 - In case of conflicts due to improper coordination by any Contractor, the Owner/Architect/Engineer's resolution will be final. No compensation will be awarded for extra work required to resolve conflicts or to coordinate the work of all contracts.
 - 3. 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.
 - 4. 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.
- C. Shop Drawings and Submittals Coordination Procedure:
 - 1. The Architect/Engineer will forward copies of relevant shop drawings to all prime Contractors, whose work may be subject to that of others, as solely determined by the Architect/Engineer.
 - 2. The Contractor shall then, within five (5) calendar days of receipt, review said shop drawings provided by the Architect/Engineer for the purposes of resolving field and fabrication problems and as a way to coordinate the work.
 - 3. Immediately notify the Architect/Engineer should a purported conflict in the work be discovered so that the Architect/Engineer can investigate and take appropriate action.
 - 4. If a shop drawing was so provided by the Architect/Engineer and a conflict in the work was not brought to the attention of the Architect/Engineer, then the conflict shall be immediately corrected by the Contractor submitting the shop drawing.

- D. Each Contractor shall also coordinate the work by complying with the following:
 - 1. <u>Construction Schedule:</u> Each Contractor shall provide a construction schedule as specified in Section 013216 Construction Schedules.
 - 2. <u>Weekly Schedule:</u> By 3:00 PM of each Friday during the construction period, each Contractor shall email a typed memo addressed to the Architect/Engineer/Owner's resident field engineer/inspector and designated office project manager summarizing the work for the following week. The memo shall also be faxed or emailed to each Prime Contractor's home office and the Owner. The memo shall briefly itemize the planned activities for the coming week. The memo shall also include a summary of expected material/equipment deliveries, concrete pours, utility tie-ins, excavated material removals and other heavy construction traffic that may impact the work activities for the coming week.
 - 3. Email Account: Each Contractor shall maintain an email account that shall be used to improve communication. An email shall not constitute a formal advisement regarding the terms and conditions of the contract. Email shall only be considered an informal way of notifying relevant parties of project related activities.
 - 4. Email List: Each Contractor, within five (5) calendar days from the Notice To Proceed, shall provide a list of email addresses for each major equipment supplier and local representative, if such exists. A contact person shall be provided for each email address.
 - 5. <u>Work Plan:</u> All Contractors shall within five (5) calendar days from the date of the Notice to Proceed, submit to the Engineer a type written work plan in bullet format of the sequence of construction activities from start to finish of construction. A facsimile will not be accepted. All work plans shall include a description of the different major phases of construction as pertaining to the individual construction contract. As a minimum each work plan shall include the tasks and subtasks specified in Section 013216 for the project schedule.
 - a. Each Prime Contractor's work plan shall be complete and shall address every phase of the scope of the Contract.
 - b. The Engineer/Architect will forward all work plans to all other Prime Contractors.
 - c. Each Prime Contractor shall then prepare a construction schedule as specified below using the work plans prepared by others and his/her own.
 - 6. <u>Equipment and Startup Schedule:</u> All Contractors shall also submit a preliminary equipment delivery schedule and a preliminary startup schedule for all equipment and systems being furnished under the Contract. This schedule shall be submitted within 30 calendar days from the date of the Notice To Proceed.
 - a. Include an early and late date for each item.
 - b. Indicate the time necessary to physically install and ready each item so that other work can be completed by other Prime Contractors.
 - c. The Engineer/Architect may waive this schedule if the Contractor has adequately shown the information on the construction schedule, in the opinion of the Engineer/Architect.
- E. <u>Project Coordination Meetings:</u> All Contractors shall participate in and attend the Project Coordination Meetings as specified below:
 - 1. Up to three (3) project coordination meetings will be held at the Architect/Engineer's or Owner's office as specified herein and in Section 013216.
 - 2. The meetings will be held when so called for by the Architect/Engineer.
 - 3. Each meeting may last up to eight (8) hours with one hour for lunch.
 - 4. The Architect/Engineer will prepare the final agreed version of the schedule and distribute it to all Contractors.
 - 5. The Architect/Engineer reserves the right not to hold these meetings if in his/her opinion they are not needed.
 - 6. All Prime Contractors shall be required to attend the meetings.

7. The time associated with attendance at the meetings shall be included in the lump sum bid and be subject to a credit of \$150 per hour for each unused hour that the Contractor does not attend.

1.08 CONTRACTOR'S JOB SITE SUPERINTENDENT

- A. Each Contractor shall employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.
- B. Each Contractor shall name the job site superintendent within five (5) days of the Notice To Proceed. A letter to the Architect/Engineer/Construction Manager shall be provided.
- C. He/She shall have the authority to sequence and schedule the work, and to staff the project, so as not to interfere with the work by others and to complete the work daily within the time so required.
- D. Each Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.
- E. The superintendent for Contract G shall be on the site for each work day, full time, starting within twenty one (21) calendar days from the date of the Notice To Proceed through the date of Final Completion, including all punch list items.
- F. All other construction superintendents shall be on the project site while work under his/her contract is being performed, either by direct forces or by subcontractors as stipulated above for subcontractor coordination.
- G. Each superintendent shall also visit the site daily when work is not being performed under their Contract for coordination purposes, through the Owner/Engineer. He/She shall remain on the site for a minimum of one (1) hour, if work is being performed by others. He/She shall telephone the Engineer/Architect's designated field representative to advise him/her that they are on the site to discuss matters related to coordination.
- H. Each 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/she 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: Thiells-Roseville Fire District (TRFD)

PROJECT NAME & CONTRACT DESIGNATION: TRFD2302 Thiells New Fire Headquarters

CONSTRUCTION CONTRACT NO.: TRFD2302

| 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 | See Architect/Engineer's Attachments for Additional | |
| (Printed): | Information | |
| | Response Accepted By Contractor | |
| Architect/Engineer's Signature & Date | Contractor's Signature & Date | |
| 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, | | |

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.

PART 1 GENERAL

SUMMARY

- 2.01 THIS SECTION INCLUDES PREPARATION OF COORDINATION DRAWINGS FOR ARCHITECTURAL, STRUCTURAL, MECHANICAL, PLUMBING, FIRE PROTECTION, FIRE ALARM, LIGHTING, INFORMATION TECHNOLOGY, SECURITY, AND ELECTRICAL WORK.
- 2.02 RELATED SECTIONS INCLUDE THE FOLLOWING:
 - A. Division 01 Section "Project Management and Coordination" for administrative provisions for coordinating construction operations.
 - B. Division 01 Section "Closeout Procedures" for project record drawing requirements.
 - C. DEFINITION AND INTENT
 - 1. The Contract Drawings are diagrammatic only and are not intended to show the alignment, exact physical locations, or configurations of such Work. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. When possible, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing coordination drawings.
 - 2. Coordination drawings are drawings prepared by Contractor that superimpose Work of multiple trades involved in the construction process. Coordination drawings indicate systems and components to be installed by the Contractor with the intention to maximize clear height and free area in Ceiling Cavities, Mechanical Rooms, Electrical Rooms, Boiler Rooms, and Plumbing/Water Rooms; to allow for proper and adequate equipment service clearances, minimize space required by shafts and chases and provide the most efficient functioning and use of materials possible while complying with the final performance and finished appearance required by the Contract Documents.
 - 3. Coordination drawings are intended to show the relationship and integration of different construction elements that require coordination during fabrication or installation to fit in the space provided, to function as intended, and to present the intended final finished appearance.
 - 4. The Contractor shall manage the process so that each trade/ sub-contractor provides all required information in a timely manner. Coordination Drawings may be completed on a phased basis so as not to delay the overall project schedule. The CPM Schedule specified elsewhere in Division 01 Section "Construction Progress Documentation" shall include the submission of Coordination Drawings. The same shall demonstrate how the Contractor intends to integrate the submission of Coordination Drawings to suit the overall project schedule.
 - 5. Contractor shall maintain equipment access and pathways as indicated on the Drawings. Floor space in MEP equipment rooms shall be maintained as indicated on the Architectural Drawings. Contractor shall clearly indicate access and floor space to be maintained in coordinated shop drawings submitted to the Owner and Architect as per the Specifications.
 - 6. Definitions:
 - a. Building Information Model (BIM): A digital representation of physical and functional characteristics of a facility.
 - b. Coordination Model: Building Information Model(s) that demonstrates and communicates the facility data necessary to procure, fabricate, schedule, or construct the Project.
 - c. Coordination Report: A report developed to communicate and demonstrate that the facility elements have been properly coordinated and identify areas where issues may still exist.

- d. Design Intent Model: Building Information Model(s) that demonstrates and communicates the creative objectives of the designer.
- e. Fabrication/Shop Drawing: Drawing generated by the contractor from a Coordination Model based on the contract documents that communicates the information necessary to fabricate facility elements. Fabrication/Shop Drawings typically contain one system and are intended for use of trade personnel to fabricate, assemble, and install facility elements.
- f. Facility Breakdown Structure: a system-oriented hierarchical decomposition of a facility into smaller components. Typically, the facility breakdown structure is based on disciplines, trades, described by Master Format.
- g. Interference: Spatial conflict between facility elements.

D. CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- 1. Refer to Division 01 Section "Submittal Procedures" for availability of and use of Architect's CAD Background Drawings.
- E. COORDINATION RESPONSIBILITIES OF EACH PRIME CONTRACTOR
 - 1. Each Prime Contractor is required to engage a qualified drafting agency capable of producing coordination drawings and models utilizing various industry standards and file formats including but not limited to: (Revit, AutoCAD, etc.). Each Prime Contractor is responsible for providing their own clash detection process for items of their work and any work shown on the Coordination Model from previous iterations by other Prime Contractors.
 - 2. In Renovation Construction (where no new walls or floors are being constructed):
 - a. Each Contractor is required to provide field verification of all scheduled work to confirm installation fitment within existing conditions.
 - b. Each Contractor is required to submit coordination drawings depicting items listed in 013115: 3.2. Locations to be referenced using field marked reference points in the existing building in lieu of building column lines.
 - c. Each Contractor is to provide coordination drawings/models in existing spaces to confirm fitment/access and class detection between other Contractors prior to release of material installation.
 - d. Contractors providing equipment to be powered by existing power are to verify in field the existing power supplied meets the requirements of the new equipment. The Electrician providing new power for equipment is to provide field verification of existing power conditions with respect to the new equipment and power scheduled on the Contract Drawings/Approved Equipment Submittals.
 - 3. For ALL Construction: Each Contractor is required to provide a field mark out of their work to be followed by other Contractors who are to provide openings, penetrations, wiring connections, structural support, trench layout, and any other work needed by a following Contractor. Layout to be based off the approved Shop Drawings generated from the Multi Trade signed off Coordination Model. Any openings/steel support required to be installed shall be marked out on the underside of the Roof Deck by the contractor installing the items requiring the opening/support.
 - 4. The Mechanical Contractor will take on the additional responsibility of overseeing the coordination modeling/drawing process and provide additional clash detection reports of all models by other Prime Contractors using the BIM Modeling Software for New Construction Building Work. The Mechanical Contractor is to communicate any issues that arise from other Contractors not fulfilling their obligations to the Construction Manager.
 - 5. The Construction Manager will provide direction and communications between each Prime Contractor and schedule coordination meetings as required.
 - 6. Coordination Model(s): Each Contractor is to prepare and submit Coordination Drawings/Model(s) as scheduled on the Project Milestone Schedule. Coordination Model(s) are to be based on the facility breakdown structure of the Contract Drawings and/or Design Intent Model. Contractors are to perform all work utilizing 3D modeling software in order to facilitate seamless coordination with BIM workflows. All design

elements should be produced three-dimensionally in programs that can output file formats supported by Autodesk Navisworks. Coordination Model(s) are to be submitted using Autodesk Navisworks with all disciplines.

- a. Coordination Model(s) are to be submitted prior to fabrication, and installation of any element within the area represented within the Coordination Model(s).
- b. Fabrication/Shop Drawings and Construction Model(s) are to be integrated into the Coordination Model(s) or otherwise referenced in the Coordination Model(s).
- 7. Coordination Drawings. Each Prime Contractor is to export Coordination Drawings documents from the BIM authoring application in a (.pdf) for distribution and review by the Construction Manager/Architect/Engineer.
- 8. Coordination Meetings: Contractors are to attend coordination meetings bi-weekly or as required by the construction manager until the Coordination process is complete. Each Contractor is to provide details of the status of their respective portions of the coordination drawings and provide a list of any current conflicts or clash detection items at each meeting.
- 9. Coordination Drawing Sequence in New Construction (or as directed by the Construction Manager):
 - a. The Architect may, when available, provide the Design Intent Model (.RVT) but does not alleviate the responsibility of each Contractor to provide their own self-generated model.
 - b. The General Contractor shall provide the structural coordination model/coordination drawing depicting the Structural Elementals of the building (Steel, Concrete, Masonry, Floors, Roofs.
 - c. The General Contractor shall add to the coordination model, separate layers for the Architectural Contract work for partitions, walls, ceilings, soffits and other items as applicable. The General Contractor shall self-perform their own clash detection between the Structural and Architectural Items prior to sending the model to the next Contractor.
 - d. The coordination model shall then be sent to the Mechanical Contractor who will be designated the responsible Contractor to incorporate the models of the following trades and provide dedicated clash detection of all Models. The Mechanical Contractor will then detail the Mechanical items (Piping, Ductwork, and Equipment) and self-perform clash detection between Mechanical and General Contractor's Items. Mechanical Contractor to resolve clashes prior to passing the model to the Plumbing Contractor.
 - e. The Plumbing Contractor will then detail the Plumbing items onto the coordination model, self-perform their own clash detection, and then return to the Mechanical Contractor for final Clash detection.
 - f. The Electrical Contractor will then detail the Electrical items onto the coordination model, self-perform their own clash detection, and then return to the Mechanical Contractor for final Clash Detection.
 - g. Any other specialty Contractor will then detail their respective new work items onto the model and then return to the Mechanical Contractor for Clash Detection.
- F. SUBMITTALS
 - Coordination Drawings are not a replacement for shop drawings specified in the technical specifications or the Record Drawings required in Division 01. Once the Coordination model is complete and all conflicts are resolved, each Contractor is responsible to submit Shop Drawings of their respective work for final approval. Circle and clearly note deviations from Contract Documents with reason for deviation stated. Contractor failure to identify deviations from the Contract Documents does not alleviate the Contractors responsibility to provide installations per the Contract Documents.
 - 2. Coordination Clash Detection Report:
 - a. Prepare and submit a written Coordination Report generated from the Coordination Model(s) prior to fabrication, and installation of any facility element within the area represented within the Coordination Model(s). Develop Coordination Reports

identifying outstanding issues after the development of the Coordination Model(s), including but not limited to:

- 1) Clashes:
 - (a) Itemize number of clashes.
 - (b) Clash Category
 - (c) Describe clashes.
 - (d) Describe the resolution of clashes and other conflicts.
 - (e) Design changes.
 - (f) Differing site conditions.
 - (g) Hazardous, Maintenance Accessibility, or Safety related issues.
- 2) The report shall be organized by CSI Master Format 2016 specification section or by trade.
- 3) The issues identified within the Coordination Clash Detection Report are to be addressed by the Contractor in consultation with the Construction Manager and the Architect / Engineer prior to installation of facility elements. The Construction Manager may direct the Contractor to submit the issues in the Coordination Clash Detection Report as an RFI to the Architect/Engineer.
- 4) The Contractor is solely responsible for the cost of remedying any clashes that could have been discovered during the clash detection process.
- G. PROJECT CONDITIONS
 - 1. Maintain marked up set of coordination drawings at Project site available for reference by Owner and Architect.
 - 2. Failure to submit coordination drawings or indicate work to be installed on coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work not shown in coordination drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

PREPARATION OF COORDINATION DRAWINGS IN NEW CONSTRUCTION.

- 5.01 THE INTENT OF THE COORDINATION MODEL(S) IS TO COMMUNICATE THE NECESSARY INFORMATION TO CONSTRUCT THE FACILITY INCLUDING SIZE, LOCATION, AND ARRANGEMENT OF BOTH EXISTING TO REMAIN AND NEW ELEMENTS AND TO INCORPORATE THE AS-BUILT CONDITIONS.
- 5.02 DEVELOP COORDINATION MODEL(S) BASED UPON CONTRACT DOCUMENTS, DESIGN INTENT MODEL(S), AND VERIFIED EXISTING CONDITIONS.
- 5.03 COORDINATION MODEL(S) ARE TO HAVE A CONSISTENT ORIGIN THAT CAN BE REFERENCED TO A REAL-WORLD DATUM OR BENCHMARK.
- 5.04 PREPARE COORDINATION DRAWINGS FOR PROJECT USING BIM: REVIT OR SIMILAR COORDINATION DOCUMENTATION OVERLAY DRAWINGS INDICATING COORDINATION OF THE PROJECT.
- 5.05 THE CONSTRUCTION MANAGER WILL REVIEW AND DIRECT COORDINATION RESPONSIBILITIES FOR THE PREPARATION OF THE COORDINATION DRAWINGS.
 - A. The Construction Manager will direct each Prime Contractor for the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components.

- B. INFORMATION REQUIRED IN COORDINATION DRAWINGS/MODEL(S) The coordination Model(s) will include, but not be limited to, the following elements with all necessary intelligence included to produce plans, sections, elevations, riser diagrams, and schedules as applicable:
- 5.06 (LOCATIONS (CENTER POINTS AND EDGES OF COORDINATION ELEMENT) TO BE DEPICTED WITH LOCATIONS REFERENCING COLUMN LINES AND HEIGHTS REFERENCING ABOVE FINISH FLOOR HEIGHTS).
 - A. Structural Work Information Required in Coordination Drawings by General Construction Contractor:
 - 1. All Structural Steel and Miscellaneous Steel.
 - 2. Concrete, Masonry, and Foundation Walls. (Depict Sleeves and Structural Support for all utilities, piping, and conduit passing through the concrete/masonry walls).
 - 3. Floor Assembly (Including Slab edge locations and locations of sleeves dimensioned from building lines and floor lines).
 - 4. Roof Assembly (Include Roof Drains depicted and coordinated with Tapered insulation).
 - 5. Structural Support for Roof Mounted Equipment by this Contract and Other Prime Contractors.
 - 6. Structural Support for Floor/Roof Opening and sleeve locations including required openings not indicated on Contract Documents.
 - a. Architectural Work Information Required in Coordination Drawings by General Construction Contractor:
 - 1) Exterior Wall Layout for Building enclosure.
 - 2) Interior Wall and Partition Layout. Incorporate Concrete and Masonry Walls.
 - 3) Depict Wood blocking and Access Doors.
 - 4) Doors, including door swing area.
 - 5) All Ceilings Systems including support for support system. Depict final ceiling grid layout for Acoustical Ceiling.
 - b. Plumbing Work Information Required in Coordination Drawings by Plumbing Construction Contractor:
 - 1) Sizes, bottom elevations, locations of above ground piping with insulation thickness included. Include Piping Supports and Hangers.
 - Sizes, bottom elevations, locations of underground piping. Indicate Point of Connection for Site Utility Piping Connections and sleeve locations through building foundation/exterior walls.
 - 3) Support of all roof-mounted plumbing piping and equipment.
 - 4) Depict all Plumbing Valves, Drains, Vents Specialty Items.
 - 5) Required space to install, service, access, and maintain all plumbing mechanical items and systems.
 - 6) Sizes and locations of Floor Drains, Floor Sinks, cleanouts, and any other items embedded in the Floor.
 - 7) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
 - 8) Wood Blocking Locations required to support the work of this trade (for Plumbing Fixtures and other wall mounted Plumbing items.
 - 9) Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.
 - c. Mechanical Work Information Required in Coordination Drawing by Mechanical Construction Contractor
 - 1) Sizes and bottom elevations of ductwork, piping with insulation thickness, flanges, supports, and hangers included.
 - 2) Depict all Volume, Motorized, Fire Dampers, and Ductwork Access Doors.
 - 3) Sizes, bottom elevations, locations of above ground piping with insulation thickness included. Include Piping Supports and Hangers.

- 4) Depict all HVAC Valves, Drains, Vents Specialty Items.
- 5) Indicate Size and Layout of all floor/roof openings and sleeves for this contract. Indicate size of duct/pipe chase partition sizes.
- 6) Indicate Size and Layout of all Interior/Exterior Wall Openings and Sleeves for this contract.
- 7) Locations for support of all roof-mounted HVAC piping, ductwork, and equipment. (Depict all HVAC Equipment: Sizes, support, layout, access/service area, and Provide HVAC roof curb sizes and locations including Pipe Portals, Duct Curbs, Roof Rails, and other Roof Top Items.)
- 8) Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.
- 9) Power and Wiring Connection Locations for Equipment.
- 10) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
- 11) Wood Blocking Locations required to support the work of this trade.
- d. Electrical Work Information Required in Coordination Drawings by Electrical Construction Contractor (including telecommunications, data, security, lighting, and fire alarm systems scoped under the Electrical Contract):
 - 1) Runs of vertical and horizontal conduits 1-1/4-inch diameter and larger, and all cable trays, indicate bottom and sizes of horizontal conduit and cable trays.
 - Sizes, bottom elevations, locations of underground conduits. Indicate Point of Connection for Site Utility Conduit Connections and sleeve locations through building foundation/exterior walls.
 - 3) Location of pull boxes and junction boxes, dimensioned from column center lines. All to be placed in accessible locations.
 - 4) Light fixture locations and sizes.
 - 5) Wall and Ceiling Mounted Device Layout.
 - 6) Panelboard, switchboard, transformer Layout.
 - 7) Depict all roof mounted conduits/supports and equipment under this trade. (Coordinate with other Contractors to share pipe portals and equipment electrical raceways.)
 - 8) Required space to install, service, access, and maintain all electrical items and systems.
 - 9) Power and Wiring Connection Locations for Equipment.
 - 10) Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.
 - 11) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
 - 12) Wood Blocking Locations required to support the work of this trade (Including Door Holders and other surface mounted equipment).
- e. Fire Protection System Information Required in Coordination Drawings by Contractor responsible for providing Fire Protection:
 - 1) Locations of standpipes, valves, mains piping, branch lines, pipe drops, building entry piping, Inspection Test Locations, Fire Protection Specialty Piping, and sprinkler heads.
 - 2) Bottom elevation of main and branch lines, including Hangers and Supports.
 - 3) Wood Blocking Locations required to support the work of this trade.
 - 4) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
- f. Building Automation Controls Work Information Required in Coordination Drawings by Contractor Responsible for providing Building Automation Controls.
 - 1) Thermostats and wall/ceiling mounted controls devices.
 - 2) Wall Mounted Panels and controllers.
 - 3) Wood Blocking Locations required to support the work of this trade.

- 4) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
- g. Casework and Furniture Work Information Required in Coordination Drawings by Contractor Responsible for providing Casework and Furniture.
 - 1) All Casework shown on Contract Drawings.
 - 2) Depict all connections for Electrical and Communications work.
 - 3) Depict all Plumbing Connections and Cut outs for Plumbing items to be installed in casework.
 - 4) Depict all other connections by other Contractors to be installed in casework.
 - 5) Wood Blocking Locations required to support the work of this trade.
- h. Telecommunication/Low Voltage Work Information Required in Coordination Drawings by Contractor Responsible for providing Telecommunication/Low Voltage Work.
 - 1) Wall Mounted Devices.
 - 2) Sleeve Locations for all Floor/Roof Openings.
 - 3) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
- i. Security Work Information Required in Coordination Drawings by Contractor Responsible for providing Telecommunication/Low Voltage Work.
 - 1) Wall mounted panels and controllers.
 - 2) Wall mounted devices.
 - 3) Wood Blocking Locations required to support the work of this trade.
- j. Equipment Work Information Required in Coordination Drawings by Contractor Responsible for providing Equipment Work.
 - 1) Wall and Ceiling mounted devices, panels, and controllers.
 - 2) Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
 - 3) Wood Blocking Locations required to support the work of this trade.
 - 4) Power and Wiring Connection Locations for Equipment.
- B. SITEWORK COORDINATION
 - 1. The Contractor responsible for providing Sitework shall prepare Coordination Drawings depicting all sitework and utility work that is to be coordinated between other Contractors.
 - 2. Items to be provided the following in the Coordination Drawings/Model:
 - a. Utilities to be shown by the Sitework Contractor include but not limited to: Storm Piping, Footing Drains, Sanitary/Sewer Piping, Watermain piping, Fire Protection Piping, Concrete Structures, Electrical and Low Voltage Conduit, Conduit Duct Banks, Concrete Structures. Indicate Tops/Bottoms, and sizes of utilities.
 - b. Depict Utility Point of Connection locations.
 - c. Sitework Contractor to confirm heights/depths of utilities will be at correct elevations with respect to the finished grade and finished sitework.
 - d. Provide drawings coordinating concrete sidewalks and stairs with connection to the building or other existing concrete pathway connections.
- C. ELECTRICAL POWER AND WIRING COORDINATION
 - 1. All Prime Contractor's providing equipment and devices to be wired and connected to by the Electrician shall provide the contractor designated of wiring the equipment/devices with wiring diagrams and power requirements.
 - 2. The Electrician shall not release or install materials to power any equipment until the electrician has reviewed and confirmed the power requirements of the engineer approved equipment submitted by the equipment installer and verified the power supplied from the panel/breaker will meet the requirements of the approved equipment.
 - 3. The Equipment supplier will indicate on the coordination drawings the proposed locations of any wall or ceiling devices.

4. The Contractor furnishing Electrified Door Hardware, or Doors/Frames scheduled to receive electrified Door hardware or Door Controls/Security shall provide in new storefronts/door frames; internal raceway and drag wire from all electrified hardware devices to a concealed location above the ceiling in the building. The Door/Frame installer shall also notify the Construction Manager and Contractor responsible for providing hardware wiring when storefront/door frames installation is to be scheduled prior to wiring installation.

D. CONFLICTS IN COORDINATION DRAWINGS

- The issues identified within the Coordination Clash Detection Report are to be addressed by the Contractor in consultation with the Construction Manager and the Architect / Engineer prior to installation of facility elements. The Construction Manager may direct the Contractor to submit the issues in the Coordination Clash Detection Report as an RFI to the Architect/Engineer.
 - a. Each Prime Contractors shall revise their respective portions of the Coordination Drawings to eliminate the collisions and interferences identified.
 - b. Each Prime Contractor shall determine that all work can be installed without interference.
 - c. Each Prime Contractor shall approve the revised Coordination Drawings in writing indicating approval of installation coordination and clearances.

E. CONTRACTOR COORDINATION PARTICIPATION REQUIREMENT

- 1. All Contractors are required to provide information and fulfill coordination obligations identified in this specification section.
- 2. Failure to submit coordination drawings or indicate work to be installed on coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work not shown in coordination drawings. Additional costs by other Contractors to change other Contractors conflicting work if required will be the responsibility of the Contractor that failed to provide their obligated coordination responsibilities.
- 3. If a contractor fails to perform coordination services under this specification section when scheduled and within 7 days upon notice and request by the Construction Manager, in which results in a delay to another contractors scheduled release of work, then the Owner retains the right to hire an outside detailing services/surveying services to review the work of the Contract and provide coordination services to other Contractors and deduct costs from the Contractor who has failed to provide the contractual scheduling services. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required coordination information/services after notification and allotted time, then the Contractor will be required to pay the Construction Manager \$125.00 per hour via deduct change order to provide the coordination administrative services on behalf of the Contractor.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the requirements for progress meetings.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. Each 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 Construction Manage will prepare an agenda for the conference.

1.03 PROGRESS MEETINGS

- A. Progress meetings will be held approximately once every two (2) weeks during the project. 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 Construction Manager for 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's Representative or Architect/Engineer at no cost to the Owner.
- F. Meetings will be conducted by the Construction Manager at the project site or nearby location.
- 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/her 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. Chair When Architect/Engineer/Owner/Construction Manager attend meetings, Architect/Engineer, or his/her duly authorized representative, will act as chair. Should Owner-Contractor meetings be necessary, Owner will chair such meetings.
- C. Chair When Architect/Engineer/Owner/Construction Manager attend meetings, the Construction Manager or his/her duly authorized representative, will act as chair. Should Owner-Contractor meetings be neccesary, Owner will chair such meetings.
- D. Notices Construction Manager/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 the Construction Manager and Architect/Engineer. Except when the Construction Manager or Architect/Engineer determines that a prompt meeting is essential, all notices will be issued at least one week in advance of the meeting date.
- E. Agenda All parties shall inform the Construction Manager and Architect/Engineer of items desired to be discussed and the Construction Manager or 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.
- F. 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/she so orders.
- G. Minutes Minutes of meetings will be kept, written and distributed by the Chair or his/her duly authorized representative. Minutes of all meetings will be available upon request to the Chair.
- H. 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 Chair will allow each party to speak, however, he/she 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

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for preparing construction schedules and for keeping them up to date.
- B. Prepare a Critical Path type schedule and keep it up to date as specified hereinafter.
- C. All schedules shall be submitted in accordance with the requirements contained herein in Section 013300.
- D. Refer to Section 013100 regarding the requirements for attendance at Project Coordination Meetings and additional requirements concerning the submission of other project coordination and sequencing information.

1.02 SCHEDULE PREPARATION MILESTONE DATES & REQUIREMENTS

- A. Each Contractor shall prepare Draft #1 Construction Schedule for presentation and discussion during Project Coordination Meeting No. 1.
 - 1. The Architect/Engineer will provide at least seven (7) calendar days written notice regarding the date of the first meeting.
 - 2. At the Architect/Engineer's discretion, Project Coordination Meeting No. 1 may immediately take place on the same date and directly following the Pre-Construction Conference. The Notice To Proceed will contain information regarding the Pre-Construction Conference and Project Coordination Meeting No. 1 should it be so decided by the Architect/Engineer.
 - 3. <u>Draft #1 Construction Schedule</u> shall be prepared as specified hereinafter.
 - a. The schedule shall show all the major and subordinate tasks necessary to complete the project in the specified time and interim milestones.
 - b. It shall allow adequate time for other Prime Contractors to complete their related work as best estimated by the Contractor. It being understood that the Contractor's allotted time for others to perform their work is non-binding and does not relieve the Contractor from completing all the work in the specified contract completion time in accordance with the Contract Documents. It also being understood that this is the Contractor's realistic best estimate of the time needed for others to complete their related work.
 - c. The schedule shall also show the dependencies and time allocated for each task.
 - 4. The date, place, and time for Project Coordination Meeting No. 2 shall be established at the first meeting, but in no case be more than ten (10) calendar days from the date of the first meeting.
- B. As a result of the first meeting, a better understanding of each Contractor's time requirements will have been achieved. Within five (5) working days of the date of *Project Coordination Meeting No. 1*, each Contractor shall prepare <u>Draft #2 Construction Schedule</u> and submit it to the Architect/Engineer and each other Prime Contractor for review. Each Contractor shall mail his/her schedule to all parties via Overnight Mail with a Return Receipt Requested.
 - 1. *Project Coordination Meeting No.* 2 shall be attended by all Prime Contractors for the purpose of jointly developing a <u>Combined Construction Schedule</u>. The meeting shall focus on the time needed to complete each task and subordinate task and for establishing task dependencies.
 - 2. The date, place, and time for *Project Coordination Meeting No. 3* shall be established at the meeting.

C. The Architect/Engineer's decision regarding the time allotted for a given task shall be final and each Contractor shall apply necessary resources to accomplish the work. Submission of a bid shall be intended to mean that the Contractor agrees that the determination is binding.

1.03 PRIME CONTRACTORS SCHEDULE TYPES

- A. <u>Critical Path Method (CPM)</u>: The General Contractor shall prepare a Critical Path Method (CPM) type schedule as specified hereinafter.
 - 1. Contractor E shall prepare a CPM type schedule as specified hereinafter.
 - 2. Contractor M shall prepare a CPM type schedule as specified hereinafter.
 - 3. Contractor P shall prepare a CPM type schedule as specified hereinafter.
 - 4. Contractor C shall prepare a CPM type schedule as specified hereinafter.

1.04 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 Construction Manager and Architect/Engineer prior to the first payment application.
- D. The schedule, when approved by the Construction Manager, 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 36-inch by 40-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. Computer delivery, if so specified elsewhere.
 - 3. Telephone service and high speed internet cable installation.
 - 4. Lead time for control panels that are packaged as systems.

1.05 CONSTRUCTION SCHEDULE - CPM TYPE

- A. The schedule shall 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.
- B. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- C. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.
- D. Show the "critical path" of the project and task resources.
- E. It shall be prepared by a qualified scheduler regularly engaged in the preparation of CPM construction schedules.

1.06 CONSTRUCTION SCHEDULE - GANTT CHART TYPE

- A. The schedule shall 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.
- B. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- C. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.
- D. The schedule shall be plotted out in color and shall be 36-inch by 40-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.
- E. The schedule shall show the following:
 - 1. Task links/task dependency in blue ink.
 - 2. Work under the Contract in green ink.
 - 3. Work by others in blue 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.

1.07 REVISION OF PROJECT PROGRESS SCHEDULE

- A. Each Prime 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. Each Contractor shall modify his/her construction schedule to accommodate coordination of the construction contracts by the Owner/Architect/Engineer without claims for additional compensation or delay.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

1.01 SECTION INCLUDES

- A. Project record documents shall be prepared as specified herein.
- B. Fence locations shall be staked by the Contractor's surveyor in accordance with the requirements contained in Section 323113.16.

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, Construction Manager, 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 the Construction Manager and 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 one (1) benchmark.
- B. The Contractor shall, with his/her 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.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

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 <u>SUBMISSION TRANSMITTAL FORM</u>. 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 competed in its entirety. Identify each submittal and resubmittal using the form.
- B. Each individual submittal shall be identified with a 'submittal number' based on the items six or, in some cases, (eight) digit specification Section number listed in the Project Manual Table of Contents. For example: 033000 or (033000.00)
 - 1. This Section number shall be followed by a dash. The dash will be followed by the Part 2 Article and paragraph location applicable to the item being submitted. For example: 033000-2.01.A.2
 - 2. This number will be followed by a second dash and a number in parentheses which will indicate the number of times the submission was made. Use the number "(1)" for the first time the item is being submitted. Using our example: 033000-2.01.A.2-(1)
 - 3. Subsequent submissions of the item 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/she 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. <u>All</u> submittals requiring Architect/Engineer's review (except operations manuals) as required under the technical specifications of these documents shall be submitted within SIXTY (60) 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 <u>each</u> day that an outstanding submittal exists, said amount being the cost associated with the review by the Architect/Engineer.
- 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 Procore Construction Management website or by email, pending instruction by the Architect/Engineer or the Construction Manager. The Palombo Group is using Procore for construction management including submittals, RFIs, daily logs, contract management, and file sharing.
- D. All Prime Contractors shall designate a respresentative to be the primary contact for the Procore system and for managing the receipt and distribution of submittals. An invitation to register/sign in to the Procore system will be sent to this representative by the Construction Manager. A submittal distribution and 'ball in court' procedure will be established at the kick off meeting.
- E. Other submissions, such as material samples or other items as instructed by the Architect/Engineer, shall be sent to the Architect/Engineer's office as follows:

H2M architects + engineers 538 Broad Hollow Road - 4th Floor East Melville, New York 11747 Attention: H2M Project Manager (Named at Pre-Construction Conference or in the Notice to Proceed)

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.
- B. All electronic submittals shall be produced with a minimum resolution of 300 dpi and with character recognition.
- 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/she 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/she 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. <u>NO EXCEPTION TAKEN</u> 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. <u>MAKE CORRECTIONS NOTED</u>- 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. <u>REVISE AND RESUBMIT</u> 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. <u>REJECTED SEE REMARKS</u> 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. <u>SUBMIT SPECIFIED ITEM</u> 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. <u>NO ACTION TAKEN</u> Review for this item is the responsibility of another party, therefore, no action will be taken by the Architect/Engineer accordingly. Submission will be returned without review to the Contractor.
- 7. <u>NO ACTION TAKEN</u> This submittal is not required by the Contract Documents, therefore, no action will be taken by the Architect/Engineer. Submission will be returned without review to the Contractor.
- 8. <u>RECEIVED FOR RECORD</u> 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 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.
 - 5. 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".
 - 6. 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 twenty-one (21) 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 SAFETY DATA SHEETS (SDS)

- 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. Products will not be permitted to be kept on site without a SDS.

1.15 SHOP DRAWINGS

A. Submit one (1) electronic (.pdf) copy of each standard drawing, catalog cut, or other material. All shop drawings or submittals that are not in the standard 8-1/2" x 11" format shall be submitted electronically . Samples shall be delivered directly to the office of the Architect/Engineer. The Architect/Engineer will return an electronic copy of each submittal once reviewed.

- 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/her 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/her 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/her 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/her 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

SUBMISSION TRANSMITTAL FORM

CLIENT NAME: Thiells-Roseville Fire District (TRFD) **PROJECT TITLE:** TRFD2302 Thiells New Fire Headquarters

| | SUBMITTAL COVER SHEET <project number=""> - <project name=""> (This completed sheet must accompany each submittal for a valid submission)</project></project> |
|----------------------------|--|
| SUBMITTAL INFORMA | TION: |
| Submission Date: | 00 00 00 - 0.00 . A (1) Received by H2M: |
| Substitution: | CHECK HERE IS SUBMISSION IS FOR A SUBSTITUTION |
| Submission No: | 1 |
| Text Reference: | 0.00 A Submits/ Tite |
| Specification Section: | |
| Reference Drawings: | |
| CONTRACTOR INFORM | |
| | Contact: |
| | Email: |
| Contractor Address: | |
| | Street |
| Phone: | City Easts Zp |
| Reviewed By: | Review Date: |
| | |
| SUPPLIER INFORMATI | |
| Company Name: | |
| Contact: | |
| Phone: | Email: |
| dimensions, catalog number | CONTRACTOR'S CERTIFICATION STATEMENT: the have determined and verified all field measurements, field construction criteria, materials, s, and similar data and we have reviewed and approved this submittal and checked and coordinated licable approved Shop Drawings and all Contract requirements. |
| | |
| | |

2/25/2025 4:15 PM

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. <u>Electrical Work</u>: 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

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. Such permits include, but are not limited to:
 - 1. Clearing and tree removal
 - 2. Transportation and disposal of construction debris
 - 3. NYS DOT Road opening permit
 - 4. Building permits that are required by the municipality where the work is located. Arrange for inspections of the work by the municipal building department before closing in the installed work, if so required. Work will not be accepted for payment until such inspections are performed and accepted by the building department.
 - 5. Electrical Service
 - 6. Domestic and Fire Water Service
 - 7. Gas Utility Connection
 - 8. Sewer Service
 - 9. Rockland County Department of Health
- D. 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.
- 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 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.
- 1.07 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.

1.08 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.

1.09 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.

1.10 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.
 - 2. Connections to existing public water mains will be made by the water utility.

1.11 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.
 - 1. Make necessary connections to existing public sewer lines under the supervision of sewer department's representative.
 - 2. Connections to the existing public sanitary sewer will be made by the public sewer department.

1.12 COORDINATION WITH TELEPHONE UTILITY COMPANY

- A. Comply with the utility company requirements for the incoming telephone service.
 - 1. Pay the utility company's charges in connection with the installation of the incoming service.
- B. Contact the local telephone company and arrange for the removal and relocation of existing telephone equipment.
 - 1. Pay charges associated with relocation of telephone equipment by the utility.

1.13 UTILITY WORK WITHIN STATE HIGHWAY RIGHT-OF-WAY

A. Utility Work, either overhead or underground, within the boundaries of the state highway right-of-way, shall conform with procedures set forth in the Department of Transportation publications "Department Rules and Regulations Governing the Accommodation of Utilities Within State Highway Right-of-Way (Part 131 - Title 17 Transportation) and "Issuance of Highway Work Permits" (Code 7.12-2).

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

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.

- It shall be understood that all of the Work, and all of the Specifications and other a. 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.
- "REGULATORY REQUIREMENTS" or "REFERENCES" or similar wording paragraphs 3. 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.
- When a "GUARANTEE" or "WARRANTY" paragraph appears in the section it is calling 4. 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 - 2

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 Construction Manager/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:
 - a. Review conditions of installation, preparation and installation procedures.
 - b. Review coordination with related work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

| Thiells-Roseville Fire District | STATEMENT OF SPECIAL INSPECTIONS AND | | | | |
|--|---|--|--|--|--|
| 99 US-202 | TESTS | | | | |
| Thiells, NY 10984 | As required by the 2020 Building Code of New | | | | |
| | York State | | | | |
| BC NYS § 1704.3 requires the project Design Pro | fessional to complete the Statement of Special | | | | |
| Inspections and Tests. Completion of the Statem | ent of Special Inspections & Tests and submission | | | | |
| to the Building Department with the Construction I | Permit Application is a condition for issuance of the | | | | |
| Building Permit. | | | | | |
| Owner | Building | | | | |
| Thiells-Roseville Fire District (TRFD) | New Fire Headquarters | | | | |
| Project Title | | | | | |
| TRFD2302 Thiells New Fire Headquarters | | | | | |
| Project # Project A | ddress | | | | |
| TRFD2302 65 W Ramapo Road, Garnerville | , New York,10923 | | | | |
| Architect/Engineer | | | | | |
| H2M Architects, Engineers, Land Surveying and L | andscape Architecture, D.P.C. | | | | |
| Name of Person Completing this Statement | Phone Date | | | | |
| Daniel J. Aiello, PE | (631) 756-8000 January 2025 | | | | |
| Comments | | | | | |
| | | | | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | B R C E F N E Y R S E N C E | C R H E C U K I R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|---|--|--------------------------------------|---|---|---|--|
| A. Steel Construction | | | | 1705.2 | | |
| 1. Structural Steel. | Х | Х | AISC 360 Chapter N.5 | 1705.2 1705.2.1 | | |
| 2. Cold Formed steel deck. | | Х | SDI QA/QC 2011 | 1705.2 1705.2.2 | | |
| 3a. Installation of open-web steel joist and joist girders | | X | SJI specification (Section 2207.1) | 1705.2 1705.2.3 1705.2.4 | | 051200 |
| B. Concrete Construction | | | | 1705.3 Table 1705.3 | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | B R C E F N E Y R S N C E | C R H E E Q C U K I R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|---|---------------------|--------------------------------------|--|---|--|--|
| 1. Inspection of reinforcing steel, including prestressing tendons, and placement. | | Х | ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3 | 1705.3 1908.4 | X | 033000 |
| 2a. Reinforcing Bar welding - Weldability of reinforcing bars other than ASTM A706. | | Х | AWS D1.4; ACI 318: 26.6.4 | 1705.3.1 Table 1705.3 | | |
| 2b. Reinforcing bar welding-Single-pass fillet welds, maximum 5/16 inches. | | X | AWS D1.4; ACI 318: 26.6.4 | 1705.3.1 Table 1705.3 | | 033000 |
| 2c. Reinforcing bar welding - All other welds. | Х | | AWS D1.4; ACI 318: 26.6.4 | 1705.3.1 Table 1705.3 | | 033000 |
| 3. Cast in concrete anchorage | | Х | ACI 318: 17.8.2 | Table 1705.3 | X | 033000 |
| 4a. Post installed concrete members - Adhesive anchors installed horizontally or upwardly inclined to resist sustained tension loads. | Х | | ACI, 318: 17.8.2.4 | Table 1705.3 | | 033000 |
| 4b. Post installed concrete members - Mechanical anchors and adhesive anchors not defined in 4a. | | Х | ACI, 318: 17.8.2 | Table 1705.3 | x | 033000 |
| 5. Verify use of design mix. | | X | ACI 318: Ch. 19, 26.4.3, 26.4.4 | Table 1705.3, 1904.1, 1904.2, 1908.2, 1908.3 | | |
| 6. Sampling fresh concrete, slump, air content, temperature, strength test specimens. | Х | | ASTM C172, ASTM C31; ACI 318: 26.4, 26.12 | Table 1705.3, 1908.10 | x | 033000 |
| 7. Inspect concrete and shotcrete placement for proper application techniques. | Х | | ACI 318: 26.5 | Table 1705.3 1908.6 1908.7 1908.8 | X | 033000 |
| 8. Inspection for maintenance of specified curing temperature and techniques. | | Х | ACI 318: 26.5.3-26.5.6 | Table 1705.3, 1908.9 | X | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | B R C F F E Y R S N C E | C R H E E Q C U K I R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|---|---------------------|--------------------------------------|---|--|--|--|
| 9A. Inspection of prestressed concrete for - Application of Prestressing Forces | x | | ACI 318: 26.10. | Table 1705.3 | | |
| 9B Inspection of prestressed concrete for - Grouting of bonded prestressing tendons | Х | | ACI 318: Ch. 26.9 | Table 1705.3 | | |
| 10. Inspect erection of precast concrete members | | Х | ACI 318: 26.11.2 | Table 1705.3 | | |
| 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: 26.11.1.2(b) | Table 1705.3 | X | 033000 |
| 12. Inspect formwork for shape, location and dimensions of the concrete member being formed | | Х | ACI 318 Ch.19 and 20. | Table 1705.3 | | |
| C. Masonry Construction | | | | | | |
| 1. Masonry construction | X | | ACI 530 /ASCE 5/ TMS 402 and ACI 530.1 / ASCE 6 / TMS 602 Ch.3 | 1705.4 | X | 042201 |
| 2. Empirically designed masonry, glass unit masonry and masonry veneer in Risk Category IV. | | Х | TMS 402 / ACI 530 / ASCE 5 Level B Ch. 3 | 1705.4.1 2109 2110 or Ch. 14 | | |
| 3. Vertical masonry foundation elements | | Х | | 1705.4 1705.4.2 | | |
| D. Wood Construction | | | | 1705.5 | | |
| 1. Wood construction - Fabrication of wood structural elements and assemblies. | | Х | | 1705.5, 1704.2.5 | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | B R C E F N E Y R S E N C E | C R H E E Q C U K I R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|---|--|--------------------------------------|-----------------------|---|--|--|
| 2. High-load Diaphragms. | | X | | 1705.5 1705.5.1 2306.2 1704.2 | | |
| 3. Metal-plate-connected wood trusses spanning 60 feet or greater (temp. and permanent installations) | | X | | 1705.5.2 | | |
| E. Soils 1. Verify materials below shallow foundations are adequate to achieve the | | X | | 1705.6 1705.6 Table 1705.6 | x | 312323.13 |
| design bearing capacity 2. Verify excavations are extended to proper depth and have reached proper material | | Х | | 1705.6 | x | 312323.13 |
| 3. Perform classification and testing of compacted fill materials | | Х | | 1705.6 | X | 312323.13 |
| 4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill | X | | | 1705.6 | | |
| 5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly. | | Х | | 1705.6 | | |
| F. Driven Deep Foundations | | | | 1705.7 | | |
| 1. Verify element materials, sizes and lengths comply with the requirements | Х | | | 1705.7 Table 1705.7 | | |
| 2. Determine capacities of test elements and conduct additional load tests, as required. | X | | | 1705.7 Table 1705.7 | | |
| 3. Inspect driving operations and maintain complete and accurate records for each element. | X | | | 1705.7 Table 1705.7 | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | B R C E F N E Y R S E N C E | C R HE E Q C U K I R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|---|---------------------|--------------------------------------|-----------------------|---|---|--|
| 4. Verify placement, locations, and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element. | x | | | 1705.7 Table 1705.7 | | |
| 5. For steel elements, perform additional special inspections in accordance with Section 1705.2. | × | | | 1705.7 Table 1705.7 | | |
| 6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3. | X | | | 1705.7 Table 1705.7 | | |
| 7. For specialty elements, perform additional inspections as determined by the registered design professional responsible in charge | X | | | 1705.7 Table 1705.7 | | |
| G. Cast-In-Place Deep Foundations | | | | 1705.8 | | |
| 1. Inspect drilling operations and maintain complete and accurate records for each element | X | | | 1705.8 Table 1705.8 | | |
| 2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end bearing strata capacity. Record concrete or grout volumes. | | | | 1705.8 Table 1705.8 | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I D I C | REFERENCE STANDARD | B R C E F N E Y R S E N C E | C R H E E Q C U K I R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|--|---------------------|---------------------------------|-----------------------|---|--|--|
| 3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3 | | | | 1705.8 Table 1705.8 | | |
| H. Helical Pile Foundations | | | | 1705.9 | | |
| 1. Installation and load tests (if applicable) | | | | 1705.9 | X | 316615 |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | B R C F N R S R S N C E | C E Q U E Q U I K E D F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|--|---------------------|--------------------------------------|-----------------------|---|------------------------------------|--|
| I. Fabricated Items | | Х | | 1705.10 1704.2.5 | | |
| J. Wind Resistance | | | | 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. | | Х | | 1705.11 | X | |
| 1a. Structural wood - Field gluing operation of elements of main wind force-resisting system (MWRS). | Х | | | 1705.11.1 | | |
| 1b. Structural wood - Nailing, bolting, anchoring, and fastening elements of the MWRS. | | Х | | 1705.11.1 | X | 061000 |
| 2a. Cold formed steel - Welding operations of elements of MWRS. | | Х | | 1705.11.2 | | |
| 2b. Cold formed steel - Screw attachments, bolting, anchoring, and fastening of elements of MWRS. | | Х | | 1705.11.2 | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | BR CE F NE YR SE N CE | C R H E Q C I K R I E F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|--|---------------------|--------------------------------------|-----------------------------|--|--|--|
| 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 1705.11.3 | X | 061000 073113 |
| K. Special Inspections for Seismic Resistance: Applicable to specific structures, systems, and components. | | | | 1705.12 | | |
| 1. Structural steel - Seismic force-resisting systems & elements. | Х | | AISC 341 Chapter J | 1705.12.1.1 or 1705.12.1.2 | | |
| 2a. Structural wood - Field gluing operation of elements of seismic force-resisting system (SFRS). | Х | | | 1705.12.2 | | |
| 2b. Structural wood - Nailing, bolting, anchoring, and fastening of elements of SFRS. | | Х | | 1705.12.2 | | |
| 3. Cold-formed steel framing - welding and fasteners. | | Х | | 1705.12.3 | | |
| 4. Designated seismic systems - verify that label, anchorage, and mounting conforms to the certificate of compliance. | | Х | ASCE 7 Section 13.2.2 | 1705.12.4 | | |
| 5. Architectural components. | | Х | | 1705.12.5 | | |
| 6. Plumbing, Mechanical and Electrical components. | | Х | | 1705.12.6 | | |
| 7. Storage racks and access floors | | Х | | 1705.12.7 | | |
| 8. Seismic isolation systems. | | Х | | 1705.12.8 | | |
| 9. Cold-formed steel special bolted moment frames. | | Х | | 1705.12.9 | | |
| L. Structural Testing for Seismic Resistance: Applicable to specific structures, systems, and components. | | | | 1705.13 | | |

| INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BC NYS) | C O N T I N U O U S | P E R I O D I C | REFERENCE STANDARD | BR CEF NE YR SEN CE | C R H E Q C U K I F D | IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY |
|--|---------------------|--------------------------------------|-----------------------------|------------------------------------|-----------------------------------|--|
| 1. Structural steel. | Х | Х | AISC 341 Chapter J | 1705.13.1 | | |
| 2. Nonstructural components. | | Х | ASCE 7 Section 13.2.1 | 1705.13.2 | | |
| 3. Designated seismic systems. | | Х | ASCE 7 Section 13.2.2 | 1795.13.3 | | |
| 4. Seismic isolation systems | | Х | ASCE 7 Section 17.8 | 1705.13.4 | | |
| M. Sprayed Fire-Resistant Materials [BF] | | | | 1705.14 | | |
| 1. Physical and visual tests. Applicable to specific structures. | | Х | | 1705.14.1 | | |
| 2. Structural member surface conditions | | Х | | 1705.14.2 | | |
| 3. Application. | | Х | | 1705.14.3 | | |
| 4. Thickness. | | Х | ASTM E 605 | 1705.14.4 | | |
| 5. Density. | | Х | ASTM E 605 | 1705.14.5 | | |
| 6. Bond strength. | | Х | ASTM E 736 | 1705.14.6 | | |
| N. Mastic and Intumescent Fire-Resistant Coatings [BF]. | | Х | AWCI 12-B | 1705.15 | | |
| O. Exterior Insulation and Finish Systems (EIFS). | | Х | ASTM E 2570 | 1705.16 | | |
| P. Fire-Resistant Penetrations and Joints [BF] High rise building or buildings assigned to Risk Category III or IV. | | Х | ASTM E 2174 ASTM E 2393 | | | |
| Q. Testing for Smoke Control [F] | | Х | | 1705.18 | | |

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. <u>Water Infiltration</u>: If the Contractor observes water infiltration (unintended) into a completed building or an ongoing construction site, he/she must immediately report the condition to the Owner, Construction Manager 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. <u>Handling of Water-Damaged Building Materials and Construction</u>:
 - 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, Construction Manager and Architect/Engineer immediately. The Owner, Construction Manager 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. <u>Visible Mold/Mildew</u>:
 - 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/she shall immediately suspend construction operations in the area, and report the condition to the Owner, Construction Manager 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 |

1.01 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Portable Chemical Toilet Facilities.
 - 2. Dumpsters.
 - 3. Temporary Electric Power.
 - 4. Temporary Lighting.
 - 5. Water service and distribution.
 - 6. Temporary heat.
 - 7. Temporary Barricades.
 - 8. Temporary Storm Drainage.
 - 9. Temporary Staging Area, Access Roads, Site Signage, and Site Fence
 - 10. Building and Site Maintenance
 - 11. Temporary Fire Extinguishers and Signage for Building Construction:
- C. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds.
 - 2. Architects/Engineers field office.
 - 3. Telecommunication service.
 - 4. Dewatering facilities and drains.
 - 5. Temporary enclosures.
 - 6. Hoists and temporary elevator use.
 - 7. Rodent and pest control.
 - 8. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Environmental protection.
 - 2. Tree and plant protection.
 - 3. Pest control.
 - 4. Security enclosure and lockup.

1.02 DIVISION OF RESPONSIBILITIES

A. General: Each prime contractor is specifically assigned certain responsibilities for temporary services and facilities to be used by other prime contractors, and other nonprime contractors and separate entities at the site, Owner's workforces, Construction Manager, Architect, testing agencies, personnel of governing authorities, and personnel authorized to be at project site during contract time.

1.03 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect. The Architect will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.
- B. Water Service: Use water from the Owner's existing water system (when available) without metering and without payment of use charges. Access to water shall be designated by the Owner. If existing water supply system is not available, then provide water tanks as required and fill with potable water to supply the Temporary Water Distribution System.

- C. Electric Power Service:
 - 1. Use of electric power from the Owner's permanent power system (when available) will be granted to all prime contractors without payment of use charges. Temporary Heating shall not use electricity as primary heat source.

1.04 SUBMITTALS

- A. Temporary Utilities: The prime contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, each prime contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.
- C. Temporary Signage: Provide shop drawings, indicating the size and layout of the signs, color choices for Owner selection and installation details.
- D. Submit Product Data and Shop Drawings of Proposed Temporary Facilities.

1.05 QUALITY ASSURANCE

- A. Regulations: The prime contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department and rescue squad rules.
 - 5. Environmental protection regulations.
- B. Standards: The prime contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Local custom and trade union jurisdictional settlements do not control the scope of work included in each prime contract.
 - 2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.06 PROJECT CONDITIONS

- A. Temporary Utilities: The prime contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: The Installer of each permanent service shall assume responsibility for its operation, maintenance, and protection during use as a construction facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work

progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: The prime contractor shall provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.
- B. Lumber and Plywood:
 - 1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
 - 2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thicknesses indicated.
 - 3. For fences and vision barriers, provide minimum 3/8-inch- thick exterior plywood.
 - 4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood.
- C. Insulation: Unfaced mineral-fiber blanket manufactured from glass, slag wool, or rock wool; with maximum flame spread and smoke developed indices of 25 and 50, respectively.
- D. Gypsum Wallboard: Provide gypsum Type X wallboard on interior walls of temporary barricades or partitions.
- E. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.
- F. Paint: Comply with requirements of Division 9 Section "Painting."
 - 1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
 - 2. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
 - 3. For interior walls, provide 2 coats interior latex eggshell wall paint.
- G. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- H. Water: Provide potable water approved by local health authorities.
- I. Open-Mesh Fencing: Provide 0.12-inch- thick, galvanized 2-inch chain-link fabric fencing 8 feet high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.02 EQUIPMENT

- A. General: The prime contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide 20AMP Quad receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment. Each Quad Outlet to be connected to Temporary Electric Panel(s) with dedicated 20 Amp Circuits.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. Lamps and Light Fixtures: Provide service lamps of wattage required for adequate illumination per OSHA requirements. Provide guard cages or tempered-glass enclosures, when exposed to breakage. Provide lamps suitable for exterior conditions when lamps are exposed to exterior conditions or moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
 - 1. The use of indirect fired source heaters (Heat source placed outside the building, ducted into the building) shall be the primary source of temporary heat.
 - 2. Use of gasoline-burning space heaters, direct fire, open flame, or salamander-type heating units is prohibited. Temporary heating sources utilizing electric power as energy source, shall not be used on this project.
- G. Temporary Offices: Each contractor shall provide its own prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 EXECUTION

3.01 TEMPORARY FACILITIES RESPONSIBILITIES - DESIGNATED IN 011200 MULTIPLE CONTRACT SUMMARY.

- A. See 011200 Multiple Contract Summary for designated Contractor responsibility of temporary facilities indicated below.
 - 1. Temporary Portable Chemical Toilet Facilities
 - a. Temporary Portable Chemical Toilet Facilities shall comply with regulations, CDC guidelines, and health codes for type, location, operation, and maintenance of fixtures and facilities.
 - 1) Provide enough portable toilet facilities in suitable quantity to service all workers who are to utilize facilities.
 - 2) Provide Portable Toilet Facility at Staging area and areas near building.
 - 3) Provide enough portable toilet facilities in suitable quantity to service all workers who are to utilize facilities.

- 4) Provide toilet tissue, paper towels, paper cups, hand sanitizer, and similar disposable materials for each facility. Provide covered waste containers for used material.
- 5) Provide separate facilities for male and female personnel.
- 6) Provide portable handwash sink(s) with soap dispensers and paper towels.
- 7) Provide at minimum (1) portable handwash sink at staging area.
- 8) Install Portable Toilets and Portable Sinks. where facilities will best serve the Project's needs.
- 9) Replenish consumable materials as utilized. Provide cleaning of facilities when required.
- 10) Contractors are to not use owner's existing restrooms or facilities.
- b. Dumpsters:
 - Dumpsters are to be provided as needed to dispose of all materials needing to be removed from the building/site and waste materials associated with the new building/site work indicated on milestone schedule or when complete with their own work (whichever occurs later).
 - 2) Dispose of materials lawfully.
 - 3) Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials will be by the contractor designated responsible for removing the hazardous waste.
 - 4) Surfaces/Pavement below dumpsters are to be protected and restored.
- c. Temporary Electric Power Service:
 - Temporary Electric Power Service shall consist of main power hook-up and panel board for the new building and site. Temporary service shall be maintained during all workdays and shall comply with all codes and regulations. System shall be modified as required or as directed by the Construction Manager as work progresses.
 - 2) Obtain temporary service from existing building service or local power pole. If practical, power to each location shall be tapped at transformer vault or main distribution panel, ahead of main breakers to minimize demand on service equipment from operations. Over-current protection shall be installed as required. Provide disconnect at connection to service.
 - 3) The Contractor shall pay all fees to Utility Company for Temporary Electric Power Service Connection when an existing Power Source is not indicated to already be available for connection in the Contract Documents.
 - 4) Minimum power characteristics: 240/120-volt, single phase.
 - 5) Provide distribution equipment, feeders, and branch circuit panelboards to serve:
 - (a) Temporary Lighting Service.
 - (b) Temporary convenience receptacles.
 - (c) Quad 20AMP 120V Outlet boxes to allow for 25' extension cord with walls in place; enough to accommodate requirements of the entire building.
 - (d) To accommodate construction operations requiring power, use of power tools, and start up testing of permanent electric powered equipment prior to its permanent connection to electrical system.
 - (e) Each Contractor shall provide his own extension lines, and other special equipment. Welding equipment shall run from generator trucks. Any specialty high voltage/amperage power required beyond what's provided by under the Temporary Electric Power Service is to be provided by the contractor requiring the specialty power.
 - (f) The Contractor shall be responsible for initial connections and final demolition of all temporary fixtures and wiring at direction of the Construction Manager.
 - (g) Provide Electric Service and connection to Trailers as shown on Staging and Logistics Plans. Each Trailer to receive 100 AMP Service.

- (h) For additional Trailers not indicated on Staging and Logistics plan, each Contractor will be responsible for hookup of their own project trailers by a licensed electrician to existing service or temporary electric panel provided per Staging Area and Logistics Plan if indicated for Contractor Trailer Power. The Contractor shall erect poles safely and sufficient for site overhead power and telephone service. The Contractor shall disconnect all items and restore damaged areas upon project completion. If abused, power from temporary service will be disconnected.
- 2. Temporary Lighting Service:
 - a. When an overhead floor or roof deck has been installed obstructing daylight from overhead, the Contractor shall provide temporary lighting with local switching suitable for exterior weather conditions within the building under the roof deck prior to building weathertight roof enclosure.
 - b. Temporary lighting shall be maintained in accordance with OSHA standards for power and foot candle levels in all areas, rooms, and corridors while workers occupy the space. Temporary lighting shall be controlled by time clocks and lighting contactors; settings to be coordinated by the Construction Manager.
 - c. Additional lighting beyond OSHA standards for specialty work is to be provided by each contractor performing specialty work requiring the additional lighting.
 - d. As ceilings are installed, the Contractor is to move temporary lights as needed to maintain lighting in all work areas during working hours.
 - e. Security lighting for building exteriors shall be continuously operational and maintained. The Contractor shall provide a minimum of (6) exterior temporary site lights at 10,000 Lumen each, ON SITE TO BE LOCATED by CM.
 - f. Temporary Site Lighting: The Contractor is to maintain existing exterior lighting to adequately light the entrances and exits of project site.
 - g. Temporary lighting shall be controlled by time clocks and lighting contactors; settings to be coordinated by the Construction Manager.
- 3. Temporary Water Service:
 - a. If existing water service is available by Owner, the Contractor shall provide and maintain temporary water service from Owner existing water source.
 - b. If existing water service is not available, then the Contractor designated as responsible for the Temporary Water service shall supply potable water tank(s). The Contractor shall refill water tank(s) with potable water as other contractors utilize the supplied water until final water service is installed.
 - c. Provide distribution piping of sizes and pressures adequate for construction and hose bibs on site as to provide service to all areas of construction activities as required throughout the construction period. (Allow for 50' water extension hose to work areas.)
 - d. Each Contractor shall provide temporary water as needed for their own work until Temporary Water Service is installed.
 - e. Water service shall be potable and modified as required or as directed by the Construction Manager as work progresses.
 - f. Sterilization: Sterilize temporary water piping.
 - g. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly.
 - h. Temporary Heating Service:
 - Upon enclosure of the new building(s) and addition(s) (by either temporary barriers or permanent wall systems) or as indicated by the milestone schedule, whichever is sooner, the Contractor shall provide Temporary Heating Service: equipment, heaters, duct, and all fuel necessary to continue construction work and maintain proper heated conditions in the buildings at a minimum temperature of 50°F.

- (a) The use of indirect fired source heaters (Heat source placed outside the building, ducted into the building) shall be the primary source of temporary heat. The contractor shall provide duct from the heaters into the various areas of the building. In no case shall temperature in the building be less than 50°F.
- (b) Substitutions of Temporary Heating Method may be proposed and reviewed at the discretion of the Construction Manager/Architect.
- (c) Use of gasoline-burning space heaters, direct fire, open flame, or salamander-type heating units is prohibited. Temporary heating sources utilizing electric power as energy source, shall not be used on this project.
- (d) Temporary Heating for Isolated work area: Each prime contractor shall provide temporary heating or dehumidification as required by construction activities for curing or drying of completed installations or for protecting stored materials or installed construction within building from adverse effects of low temperatures above the 50°F minimum temperature or high humidity.
- (e) Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize energy consumption.
- (f) The Contractor(s) shall provide manpower for maintenance, operation, and supervision for Temporary Heating Service, multiple shifts as applicable.
- (g) The Owner will not accept utilization of permanent HVAC system for temporary heat until spaces served by HVAC system have received final cleaning and project acceptance.
- 4. Temporary Barricades and Building Signage:
 - a. Provide Temporary lockable entrances / doorways and exits to the building, which is to be furnished, installed, and maintained.
 - Exits shall be maintained for exiting in emergency conditions which include doors with lockable panic hardware and closers until permanent structures are in place. Maintain Doorways throughout construction to ensure all hardware functions, and closers automatically close doors.
 - 2) Provide copies of keys to Owner, Construction Manager, and each Contractor for temporary Doors.
 - 3) Provide copies of keys to Owner, Construction Manager, and each Contractor for temporary Doors.
 - (a) Provide Temporary Interior/Exterior Partitions, which shall be at minimum fire rated 1-hour constructed of: metal stud framing, acoustic insulation, sealant.
 - (1) For interior partitions utilize painted gypsum. For Exterior Partitions, utilize painted 5/8" Fire Retardant Plywood.
 - (2) Provide sealant of all seams to prevent migration of dust.
 - (3) Adjust and Reinstall Ceiling as required at Temporary Partitions for a finished appearance from the occupied side of partition.
 - (4) Temporary interior partitions and interior doorways shall be provided to separate construction areas from occupied areas.
 - (b) The Construction Manager may direct the General Contractor to install and maintain Temporary Plastic Sheeting Partitions as needed to separate the construction areas from the occupied areas at no additional cost.
 - (c) Additional Temporary Barricades may be required due to delay of substantial completion for owner's use of section(s) of building(s) and are to be provided contractor responsible for the delay.
 - (d) The Contractor shall provide and maintain OSHA Minimum perimeter and stairwell barricades/railings at grade changes, multiple levels, and floor/roof openings.

- (1) Provide Top & Mid railings, and Toe boards per OSHA requirements.
- (2) Install posts as required to support railings.
- (3) Provide fluorescent ribbons to accent floor/roof openings.
- (4) If a Contractor should need to temporarily relocate barrier, same Contractor shall protect personnel in the area and replace barrier to original location.
- (e) Temporary infill/coverings/insulation for openings are to be provided by the Contractor that created the opening. Temporary opening infills/coverings are to meet structural requirements per OSHA guidelines and to be weathertight to allow building to remaining enclosed. Provide Temporary Weathertight/Insulated Infills at new window openings until new Windows are installed.
- (f) Provide Temporary Emergency Exit Signage within the new building to direct personnel to nearest emergency exits. Provide at all exits, stairwells, and areas where exit signs cannot be seen.
- (g) Provide Project Identification Signage at Building Entrance (Indicate Contact Names and Phone numbers of all Contractor, Construction Manager, and Owner Contacts.)
- (h) Restore all surfaces after removal of Temporary Barricades.
- 5. Temporary Building Storm Drainage:
 - a. Temporary Building Storm Drainage shall consist of Temporary drainage piping from Roof Drains to sufficient distance from of building as required to not disturb ongoing construction until final roof drain piping is installed, and final drainage utility system is completed.
 - b. Adjust Drainage Piping as directed by Construction Manager.
- 6. Temporary Staging Area, Access Roads, Site Signage, and Site Fence:
 - a. The Contractor shall provide construction of the temporary staging area, access roads, stabilized construction entrances, temporary site signage, and temporary construction fence as indicated on the Staging and Logistics Plans.
 - b. Maintain and restore staging area and access roads that are disturbed throughout construction.
 - c. Remove all temporary materials and restore all areas at completion of project.
 - d. The Contractor responsible for Site Work (Site Contractor) shall maintain access roads for suitable parking areas as indicated on Site Logistics plans.
 - 1) Re-grade, re-seed and restore any areas disturbed by parking/staging.
 - Parking Areas: Includes contractors' employees and construction vehicle parking. Minimum of 6" reference Item. #304.3 course installed over geotextile fabric.
 - 3) Temporary parking by construction personnel shall be allowed only in areas designated.
 - (a) Access Roads: Includes access roads for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Minimum of 9" reference Item. #304.3 course installed over geotextile fabric.
 - (1) Stabilized Construction entrances: Minimum 6" Thick, 50FT Length x 24' Width, 2" Stone over geotextile fabric/filter cloth. Extend width of entrance to 32' width where entrance meets existing pavement to allow turning radius of vehicles pathway.
 - (2) Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and

sidewalks at the temporary entrances, as required by the governing authority.

- (b) Construction Fence: Provide Construction fence with lockable entrance gates. Locate where indicated or enclose the entire site or the portion determined sufficient to accommodate construction operations or as indicated on Staging Area and Logistics Plan. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
 - (1) Provide at Construction Fence: open-mesh, 8-foot-high chain-link fencing with posts at 8-feet on center, set in a compacted mixture of gravel and earth.
 - (2) Provide movable fence panels with sandbags and fence clamps to prevent tampering with fence when required in areas that require adjustment during construction as approved by Construction Manager.
 - (3) Provide maintenance of Temporary Construction Fence as disturbed throughout construction to ensure site and staging area security is maintained and all gates remain operational.
 - (4) Provide minimum of (1) 4' man gate, and (3) 20' hinged double swing access gates. Each gate is to have a chain and padlock. Adjust gate hinges to prevent gating from dragging on surface.
 - (5) Provide keys for each lock to the Construction Manager, Owner, and each Contractor.
- (c) Temporary Site Signage: The Contractor shall provide all temporary Construction Signage, temporary traffic controls at junction of temporary roads with public roads.
 - (1) Engage an experienced sign painter to apply graphics. Comply with details indicated.
 - (2) Include warning signs for public traffic and "STOP" signs for entrance onto public roads.
 - (3) Comply with requirements of authorities having jurisdiction.
 - (4) Engage an experienced sign painter to provide the following signs to be installed by the Contractor in compliance with signage requirements (install all directional signage at all intersections):
 - (5) To direct visitors (as required to reach visitor area)
 - (6) For construction parking (as required to reach parking area)
 - (7) To direct deliveries (as required to reach material delivery area) (List each Contractor)
 - (8) "Construction Site Authorized Personnel Only" (Perimeter of Construction Fence 40' Intervals)
 - (9) Project Identification Signage at Entrance of Site (Indicate Contact Names and Phone numbers of all Contractor, Construction Manager, and Owner Contacts.)
- 7. Building & Site Maintenance:
 - a. Maintaining Temporary Access Roads and Existing Roads:
 - 1) Maintain and restore roads over the period of construction.
 - 2) Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily.
 - 3) If required, provide a minimum of once-a-week road cleaning for debris/dust accumulated.
 - (a) Road cleaning equipment to be wet/vacuum type. Contractor will clean the roads affected by all contract work. The Contractor will maintain roads until project completion.
 - (1) Snow Plowing: Provide snow/ice removal to building entrances, temporary access roads, parking areas, staging area, portable toilets, and a 5' walkway to all office trailers.

- (b) Snow/Ice Removal at Building/Adjacent Sidewalks:
 - (1) Provide snow/ice removal at sidewalk areas and entrances adjacent to building, ice/snow removal inside the building areas, and roofing areas for scheduled work.
 - (2) Protect areas from snow/ice removal and restore any surfaces damaged.
- 8. Temporary Fire Extinguishers for Building Construction:
 - a. The Contractor shall provide, until fire-protection needs are supplied by permanent facilities, install, and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
 - Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 - 2) Store combustible materials in containers in fire-safe locations outside of buildings.
 - 3) Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.

3.02 TEMPORARY TELECOMMUNICATIONS SYSTEMS (TO BE PROVIDED BY ALL CONTRACTORS)

- A. General: Engage the appropriate local telecommunication, internet service provider, or utility company to install temporary telecommunication service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials, and equipment. Comply with company recommendations.
- B. Temporary Telephones: Each Prime Contractor shall provide temporary telephone service throughout the construction period for all personnel engaged in construction activities.
 - 1. Contractors are required to lease or purchase a cellular telephone to be used by their site superintendents for communication with the other primes and the Architect.

3.03 TEMPORARY FACILITIES INSTALLATION (TO BE PROVIDED BY ALL CONTRACTORS)

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. The prime contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.04 SUPPORT FACILITIES INSTALLATION (TO BE PROVIDED BY ALL CONTRACTORS)

- A. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access as directed by the Construction Manager.
 - 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 50 feet of building. Comply with requirements of NFPA 241.

- C. Field Offices: Each prime contractor shall provide an insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small meetings. Furnish and equip offices as follows:
 - 1. Furniture: Furnish with a desk and chairs, a 2-drawer file cabinet, plan table, plan rack, and a bookcase.
- D. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site. Flammable liquids are not to be stored in building at any time and to be stored in proper rated containers.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION (TO BE PROVIDED BY ALL CONTRACTORS)

- A. Operations of the Contractor may not block, hinder, impede, or otherwise inhibit the safe and expeditious exiting of the building's occupants during an emergency.
- B. In the event of an emergency, (designated by the sounding of the fire alarm system) all construction activities must immediately cease. Contractor's work force will evacuate themselves from work areas and remain outside of work areas until the "all clear" is given. No work operations will be tolerated during the evacuation of the building or during an emergency.
- C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.
- D. Building Security Enclosure and Lockup: Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
 - 1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- E. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid using tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.06 OPERATION, TERMINATION, AND REMOVAL (TO BE PROVIDED BY ALL CONTRACTORS)

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities and good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Construction Manager requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized

use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of each prime contractor. The Owner reserves the right to take possession of project identification signs.

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. <u>Protection of Land Resources:</u> 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. <u>Work Area Limits</u>: 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. <u>Protection of Landscape:</u> 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. <u>Reduction of Exposure of Unprotected Erodible Soils:</u> 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. <u>Temporary Protection of Disturbed Areas</u>: 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. <u>Protection of Water Resources:</u> 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. <u>Washing and Curing Water:</u> 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. Monitor water areas affected by construction.
- K. <u>Protection of Fish and Wildlife Resources:</u>
 - 1. Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife.
 - 2. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- L. <u>Protection of Air Resources:</u> 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.
- M. <u>Particulates:</u> 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.
- N. <u>Particulates Control:</u> 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.

- O. <u>Hydrocarbons and Carbon Monoxide</u>: Control monoxide emissions from equipment to Federal and State allowable limits.
- P. <u>Odors:</u> Control odors of construction activities and prevent obnoxious odors from occurring.
- Q. <u>Reduction of Noise:</u> 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.

1.01 SECTION INCLUDES

A. Project sign

1.02 REFERENCES

- A. Lumber Standard: American Softwood Lumber Standard; U.S. Department of Commerce Product Standard PS1.
- B. Softwood Plywood Standard: Construction and Industrial; U.S. Department of Commerce Product Standard PS1.
- C. New York State Department of Transportation Standard Specifications.

1.03 SUBMITTALS

- A. Submit under provision of Section 013300.
- B. Submit proof sheet of sign.
- C. Color samples: match specified colors.

1.04 QUALITY ASSURANCE

A. Painter's Qualifications: Sign shall be prepared by a professional sign painter.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Framing and Posts: Standard Southern Pine: S4S; preservative treated for ground contact.
- B. Sign: Aluminum blank sign board with vinyl sheeting. Panel material shall be either Aluminum Alloy 6061-T6, 5154-H38 or 5052-H38.
- C. Type: Caslon 540 with the exception of the logotype.
- D. Select finishes to withstand weathering, fading and chipping for duration of sign placement.

2.02 FABRICATION

- A. Sign and structure shall be designed to withstand 100 mile per hour wind velocity.
- B. Prepare surface of aluminum sign board before application of vinyl sheeting. The board shall not be handled between the cleaning operation and application of sheeting except by device or clean canvas gloves.
- C. Cover aluminum blanks with vinyl sheeting to achieve background color.
- D. Apply sheeting to the aluminum panel by the vacuum application process or mechanical process in accordance with the recommendations of the sheeting manufacturer.
- E. Silk screen copy and logo on this surface.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Sign shall be in place from the start of construction until 90 days after substantial completion. The signs shall be removed and remain the property of the Contractor. Fill post holes when sign is removed.
- B. Set posts plumb, 4 feet minimum into the ground.
- C. Embed posts in concrete and compact.
- D. Fasten sign in a level position securely to posts with heavy-duty stainless steel fasteners. Provide at least three (3) equally spaced lag bolts into each post.
- E. Provide bracing between posts.

3.02 PROTECTION

- A. Maintain the sign clean, plumb and level.
- B. Repair deterioration and damage.
- C. When directed after project closeout, remove sign from site.

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 warrantees 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. Pumps shall conform to the requirements of the Hydraulic Institute.
 - 3. 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 CONTROL PANELS, MCC'S AND SWITCHBOARDS

- A. All control panels, motor control centers, and switchboards shall be fabricated with pilot lights, selector switches, PLC, graphics display panels, elapsed time meters and other components that shall match.
 - 1. This does not require that all components be one manufacturer, but does require that the like components be of the same manufacturer.
 - 2. The Contractor shall coordinate the shop drawing submittals to indicate that all components have been selected on this basis.
 - 3. This requires the Contractor to advise each control panel supplier that product options are limited in this regard.
- B. Replacement of unlike products delivered to the job site shall be the responsibility of the Contractor.
- C. All costs associated with the replacement shall be borne by the Contractor.

2.03 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.

2.04 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 work of all other prime trades and verify that all such work is in conformance with the Contract Documents and 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, disfigurations 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.

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

- A. Section 013300 SUBMITTALS for Submittal procedures.
- B. Section 014500 QUALITY CONTROL: Procedures for testing and certifications.
- C. Section 016100 FIBER CEMENT SIDING (HARDIE): Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 079200 Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
 - 4. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).
- C. CARB (SCM) Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.
- D. SCAQMD 1113 Architectural Coatings; 1977, with Amendment (2016).
- E. SCAQMD 1168 Adhesive and Sealant Applications; 1989, with Amendment (2017).

1.05 SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

- A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Joint Sealants: SCAQMD 1168 Rule.
 - 3. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).
 - 4. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

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 Architect/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. All control panels shall be wood crated.
 - 1. All sides of the control panel shall be covered with 3/4" plywood.
 - 2. The control panel number or name shall be printed on all sides of the crate in 1' high black lettering.
 - 3. The manufacturer's name, Contractor's name and project name shall also be printed on the front of the crate.
 - 4. All control panels and centers shall be packaged with three (3) copies of the approved wiring diagram inside the control panel enclosure in a separate plan holder attached to the inside door. The words "APPROVED FOR CONSTRUCTION" shall be indicated on each page of the wiring diagram.
- G. Delicate instruments and devices, reagents, chemicals, and glassware shall be shipped in packaging normally provided by the manufacturer.
- H. 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, Construction Manager, 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 Architect/Engineer at no additional costs.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

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 prime contractors.
- B. Perform final cleaning at least five (5) days before the date set for ceremonies to dedicate the new facility wherein the Owner will provide tours to the general public and/or dignitaries. The site shall be clean, organized, and totally free of construction debris, tools, and equipment.

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. Clean and disinfect all pre-existing toilet facilities that were entered upon and used by the Contractor during the project.
- 21. Replace damaged existing toilet fixtures, such as sinks, toilet bowls, urinals, and mirrors, with in-kind units if so directed by the Architect/Engineer.
- 22. Wash all existing floors that were in any way impacted by the construction operations.
- 23. Rake clean landscaped surfaces. Final mow all areas grassed and sodded during the work.
- 24. 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.
- 25. Polish all new handrail installed as work of this contract with a commercially available aluminum cleaner recommended by the railing manufacturer.
- 26. Clean dirt that has accumulated between grating and grating angles/supports.
- 27. Vacuum the inside of all control panels provided under this Contract after the panel has been wired.
- 28. Pressure wash curbs, walks and concrete platforms on new and existing process tankage.
- 29. Pressure wash all gravity thickener sumps using hot water and cleaner. Remove all stains on concrete, grating, and surrounding surfaces caused by sludge. Clean sump even if the Owner has been operating the gravity thickener for any period after the date of Substantial Completion.
- 30. Fill in all holes in concrete that remain after temporary handrail is removed. Non-shrink grout shall be used.
- 31. Thoroughly clean all pits, galleries, manholes, pipes, channels, tanks, wells and all structures entered upon.
- 32. Broom clean and hot pressure wash all pipe trenches.
- 33. 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.

34. Clean kitchen equipment in public facilities to meet health department requirements.

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/Construction Manager at least 14 calendar days prior to the start-up of each item or system so that he/she can schedule the startup with the Owner, utilities, and other Prime Contractors.
- 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

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/she 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 or where this Contract is for a Prime Electrical Construction Contract.
- B. Submit the following items to the Architect/Engineer with the final application for payment:
 - 1. Final Application for Payment prepared by the Architect/Engineer for Contractor's execution showing final amount of Contract including change orders.
 - 2. Maintenance Bond prepared in accordance with the Contract or General Conditions.
 - 3. Utility company signoffs and inspection approvals, if applicable.
 - 4. Federal, state, county, town and local signoffs and inspection approvals, where applicable.
 - 5. Final Application for Payment and continuation (G702 and G703)
 - 6. Contractor's Certified Payrolls
 - 7. OSHA cards for all workers
 - 8. Contractor's Affidavit of Payment of Debts and Claims (G706)
 - 9. Contractor's Affidavit of Release of Liens (G706A)
 - 10. Final list of Subcontractors (G705)
 - 11. Subcontractor's Affidavit of Payment of Debts and Claims (G706) (for each subcontractor used)
 - 12. Subcontractor's Affidavit of Release of Liens (G706A) (for each subcontractor used)
 - 13. Consent of Surety to Final Payment (G707)
 - 14. 2 year Maintenance Bond 100% of contract including change orders
 - 15. Contractors letter guaranteeing workmanship 2 years
 - 16. Product data, Maintenance manuals and Warranty Information
 - 17. As Built Documentation
 - 18. Attic Stock / Spare Parts (provide proof of delivery transmittal signed by owner)
 - 19. Training and Demonstrations (provide sign-in from training session)
 - 20. 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

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

- 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

2.

- 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 USB drives or transmitted via a file share service.
 - 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 one (1) copy 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 two (2) paper copies and two (2) electronic 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

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.
- C. One (1) complete set of Contract Documents shall be kept in the field office.

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.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.
- G. At close of project, turn over field office file to Engineer.

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. The Contractor shall include a separate line item cost in the bid amount for preparation of record drawings.
 - 1. Stipulated amount will be released when the record drawings have been accepted by the Architect/Engineer.
 - 2. Satisfactory evidence shall be provided by the Contractor demonstrating compliance with these specifications and said drawings have been delivered and deemed in compliance with the specifications by the Architect/Engineer.
 - 3. Progress payments will be allowed against the line item in the Schedule of Values only if record documents are considered accurate and up-to-date by the Architect/Engineer.

- D. Do not permanently conceal any work until required information has been recorded.
- E. 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.
- F. <u>Shop Drawings</u>: Maintain as record documents. Legibly mark-up to show changes made due to field conditions encountered during construction.
- G. Do not permanently conceal any work until required information has been recorded.
- H. Concurrent with each submission of a contractor partial payment requisition, the contractor shall submit a paper copy of up to date record drawings, including the latest corrections. Incomplete or inaccurate record drawings will be sufficient grounds for refusal to process payment requisition.
- I. Final record drawings shall be hard copy format and AutoCAD 2008 or newer digital format, completed by a competent draftsman or CAD operator with the following information as a minimum:
 - Complete and accurate listing of all imbedded and underground conduits. Drawings shall accurately show all exact locations of conduits including horizontal and vertical dimensions and explicitly list all conduits and fix their location off of building structures or monuments. Imbedded conduits shall include those below the floor slab and those installed in building walls.
 - 2. Complete and accurate listing of all exposed conduits.
 - 3. In a neatly logically organized table, a complete listing of all conduits with each individual conduit being given its own number and each junction or pullbox being given its own designation. This table shall list the starting and ending point of all major home runs along with all branch conduits and conduits main function.
 - 4. In a neatly logically organized table a complete listing of all conductors within the conduits listed above. Each conductor table shall individually list the conductors installed within each conduit and for each conductor shall designate the starting point or termination, complete path through all conduits and junction boxes, final point or termination, conductor or marking and circuit function. This shall be done for each conductor installed through the project.
 - 5. An accurate frontal elevation drawing of all motor control centers, control centers other major equipment installed. Drawings shall show all devices as installed in door or faces or equipment.
 - 6. A dimensioned drawing of all equipment installed including generator sets, load banks, transformers and all major equipment.
 - 7. Field changes of dimension and detail.
 - 8. Changes made by Change Order.
 - 9. Clarification plans not on original contract.
- J. At final contract closeout engineer will review preliminary set of final record drawings. After approval of this submission, the contractor will be required to submit one (1) set of hard copy drawings and one (1) digital CD-ROM disc including all as-built drawings in AutoCAD 2008 or newer format as detailed above. No portion of the line item bid amount in the proposal for the

record drawings will be released until final record drawings have been submitted and approved. No exceptions.

1.05 PROJECT RECORD DOCUMENTS

- A. Maintain a complete and accurate log of control and survey work as it progresses.
- B. The General Site/Civil 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 C.
- 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.
- D. The primary electric service installed by the Electric Utility shall also be located on the record drawings prepared by the Contractor's surveyor.
- E. If applicable, the primary electric service, gas service, and communication lines installed by the respective utility shall also be located on the record drawings prepared by the Contractor's surveyor.

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 .
 - 3. Electronic media will be provided free of charge on disc in a zipped format.
 - 4. Electronic media shall be returned to the Architect/Engineer upon acceptance of the as-built drawings by the Owner.

- H. Upon completion of the work, Contractor shall prepare and furnish the Engineer a set of marked up prints of the as-built drawings for review, with all changes conspicuously circled or otherwise emphasized.
- I. 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. Each drawing shall bear the legend "AS-BUILT" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.

1.07 RELATED DOCUMENTS

- A. Provide certificate of release of liens if requested by the Architect/Engineer.
- PART 2 PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED END OF SECTION

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. Spare parts shall be turned over to the Owner/Architect/Engineer approximately two (2) weeks prior to the Architect/Engineer's preparation of the Final Punch List.
 - 1. The <u>Certificate of Substantial Completion</u> will not be issued until all spare parts are delivered.
- B. 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. Two (2) counterparts of the letter shall be provided.
 - 3. The Contractor shall turn each part individually over to the Owner/Architect/Engineer.
 - 4. The Owner/Architect/Engineer will initial next to the part description on each counterpart of the transmittal letter.
 - 5. The initials represent that the part was received.
 - 6. One transmittal counterpart will be returned to the Contractor.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

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. A change order to the Contract reducing the Contract Price, by the dollar amount equivalent to the unused field service days, will be issued.
- H. 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 Architect/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 Architect/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.
- I. For control panels, explain the control sequence, timing structure, and safety precautions when working inside the panel, terminal wiring system, PLC program, if applicable, operator interface(s) and control logic.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

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 verification systems. 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 Mechanical, and Electrical Contractors 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.
 - 1. Mechanical contractor to allocate 2 men for 4 days for commissioning support.
 - 2. Provide equipment and systems start-up as specified.
 - 3. 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.
 - 4. Attend commissioning meetings, and attend to action items arising from them, as required to allow the commissioning process to proceed on schedule.
 - 5. 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.
 - 6. 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.
 - 7. 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.
 - 8. 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.
 - 9. Subsequent installation and performance verifications, made necessary due to required corrections after initial verification, shall be at the respective Contractor's expense.
- B. Each 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. Fire District 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 (FCU-104, 105, 107, 202)
 - B. Exhaust Fans (GXF 1 to 16)
 - C. Dedicated Outdoor Air Units (DOAS-1)
 - D. Gas Fired Unit Heaters (GUH-1 to 9)
 - E. Rooftop Unit (RTU-A&B)
 - F. Electric Unit Heaters (EUH-1 to 6)
 - G. Electric Cabinet Unit Heaters (ECUH-1, ECUH-2)

- H. HVLS Fans (HVLS-1,2,3)
- I. VRF SYSTEMS (CU-1A, CU-1B, CU-1C, DSCU-1,2,3, DSEU-1,2,3, FCU-104, 105, 107, 202, EU-100A, EU-100B, EU-102, EU-106, EU-109, EU-200, EU-201, EU-203, EU-205, EU-206, BC-1, BC-2)
- J. Make up Air Unit (CMAU-1)
- K. Kitchen Exhaust System (KX-1)
- L. Vehicle Exhaust Fans (VX-1,2)
- M. Equipment tags listed above are for convenience only. All equipment in each system shall be commissioned.
- N. Lighting Control System
- O. 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 is 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. <u>Training Syllabus & Agendas</u>. 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. <u>Training Record.</u> 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

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. Demolition and removal of buildings and and site improvements.
 - 2. Removing below-grade construction.
 - 3. Disconnecting, capping or sealing, and removing site utilities.
 - 4. Removal and legal disposal of all demolished materials, rubbish and debris.
 - 5. Recycling of all materials which can be removed, thoroughly cleaned and properly recycled accordingly to all applicable federal, state and local requirements.
- B. All demolition, removal and disposal Work shall be in compliance with the requirements of the Building Codes of New York State, and with all Federal and local regulations.
- C. Some existing painted surfaces contain lead-based paints. Take precautions as required to prevent spread of lead containing particles and dust. Any demolition, removal or similar disturbance of any lead containing painted surface must be performed in accordance with the OSHA Lead in Construction Standard 29 CFR 1926.62.

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of 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 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified refrigerant recovery technician.
- B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping of utility services for subsequent removal.

- 4. Submit an insect and rodent control plan, pollution control plan and temporary fire control program.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- E. 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. Include name, certification and address of technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with Building Code of NYS Chapter 33 Safeguards During Construction (Section 3303 Demolition), ANSI/ASSE A10.6 and NFPA 241.
- D. Pre-demolition Conference: Conduct conference at Project Site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review procedures for noise control and dust control.

1.07 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. The contractor shall accept the existing conditions of the premises and shall clear the site as specified. Owner assumes no responsibility for buildings and structures to be demolished. All damage or loss, whether by reason of fire, theft, or by other casualty or happening, to the building covered by the Specifications shall be at the risk of the bidder from and after the date of award of Contract, and no such damage or loss shall relieve the successful bidder from any obligation under this Contract to complete all Work as herein provided.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 2. The Owner accepts no responsibility for existing conditions at variance with information shown on the drawings.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. On-site storage or sale of removed items or materials is not permitted.

1.08 COORDINATION

A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings and residential properties.

- B. The Contractor shall conduct demolition operations and removal of debris in a manner that ensures minimum interference with streets, sidewalks and other adjacent areas, existing buildings or facilities or those under construction.
- C. Do not close or obstruct streets, sidewalks, alleys or passageways, without first obtaining all necessary municipal, other local permits and DOT permits. Do not store or place materials in streets, alleys or passageways. Conduct operations to interfere as little as possible with the use of any roads, streets, driveways, alleys, sidewalks, and other means of access and egress.
- D. The Contractor shall provide, and maintain, at Contractor's own expense, all lights, barriers, pedestrian protection, and other items that are required by traffic regulations or local law.
- E. Recycle demolition debris to the fullest extent possible.
- F. Demolition related equipment shall access the site via the existing driveway, unless otherwise approved in writing by the AHJ.
- G. Protect all existing utilities to remain along the street, sidewalks and adjoining properties during the Work of this Section.
- H. Verify the location and status of all utilities within and surrounding the Contract Limit Line (CLL).
- I. Remove fluorescent lighting fixtures containing ballasts with PCB's and dispose of ballasts containing PCB's in compliance with all applicable rules and regulations.
- J. Provide temporary fire protection in accordance with the approved plan, from the time demolition is started until rough grading is completed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Remove all debris not explicitly designated to remain from the premises and legally dispose of away from premises. Recycle demolition debris to the extent possible.
- B. Existing Materials: Existing masonry and concrete resulting from the demolition of the building may not be used as fill. Other materials such as metal, glass, wood, trash, frozen materials, roots, and other organic matter or other debris are not acceptable as backfill material.
- C. Fill and Backfill: Refer to the requirements in Division 31. Provide compaction report from an independent testing company.

2.02 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section(s) 312000 - EARTH MOVING and 312323 - FILL.

PART 3 - EXECUTION

3.01 DEMOLITION CONTRACTOR

- A. Demolition Contractor:
 - 1. Demolition Contractor shall have a minimum of Five (5) years experience on projects of similar size and complexity involving similar scope of regulatory controls and requirements. Contractor shall supply references for the representative projects including Project Name,

3.02 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents and Plot Drawing showing of existing construction/structure locations. These drawings are general in nature and do not provide detailed project information provided by Owner. The Owner does not guarantee that existing conditions are same as those indicated nor are they fully documented in Project Record on this drawing.
- C. The Contractors are advised to conduct their own thorough site visits / inspections in order to ascertain existing field conditions and materials including Hazardous Materials which are to be removed / remediated as part of this contract.

3.03 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished. See plumbing and electrical sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade unless the utility is located within 5' of the footprint of the proposed structure. In this case, the utility will be removed back to a point outside this distance for capping and future connection. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- C. Protect structures, surfaces, utilities and other construction to remain from damage caused by demolition operations. Should damage to adjacent construction or utilities occur due to Work under this Section, all costs in connection with the repair of such damage and the restoration of damaged construction to its original condition shall be borne by the Contractor.
- D. Provide temporary 6-foot-high chain link fence, including all required gates, pedestrian protection and barriers, around the site prior to start of the Work of this Section. Barriers to include protective netting for debris and polyethylene sheeting for dust control. Temporary protection shall be maintained by the contractor.
- E. Provide, erect, and maintain erosion control devices, dust control measures, temporary barriers, and security devices as specified. Make sure that the safe passage of persons around the area of demolition is maintained during the demolition operation. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
- F. Remove loose equipment, materials, supplies, and furnishings from building prior to demolition.
- G. Pump out standing water from basement or trench areas and piping of the building prior to demolition as required. Remove all mechanical equipment, piping, etc. from basement or trench areas prior to demolition.
- H. Pump out drains and drywells and remove contents from property.

3.04 PROTECTION

- A. 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.
- B. 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 existing site improvements, appurtenances, and landscaping to remain.
 - 2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 3. Provide a 6 foot high Chain Link construction fence and temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. 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.
- D. The Work of demolishing the building and structure shall be executed in a manner that will ensure adjacent property against any damage that might occur from falling debris or other cause and not to interfere with use of adjacent buildings and structures or the free and safe passage to and from the buildings and structures.
- E. All work adjacent to occupied buildings that may produce fire hazards or create nuisances or safety and health hazards from noise, vibration, gases, vapors, fumes, dust mists or odors shall not be performed unless preventive controls or measures including, but not necessarily limited to, those specified within are implemented. Special attention is brought to adjacent building fresh air intakes, air conditioning units, etc., which need protection from dust during demolition.
- F. The Contractor shall take every precaution to guard against any movement or settlement of adjacent buildings, streets, sidewalks and embankments, caused as a result of this Work. The Contractor shall be solely and entirely responsible for the safety and support of such buildings and shall be solely liable for any such movement or settlement and any damage or injury caused as a result of this Work. During demolition and grading Work, protect all existing structures that are to remain by a system of permanent shoring and bracing designed by a qualified New York State professional engineer engaged by the Contractor, at the Contractor's expense. The shoring and bracing shall be furnished and installed by the Contractor in accordance with the applicable provisions of the NYS Building Code and shall be adequately anchored and braced to resist earth and hydrostatic pressures.
- G. Shoring and Bracing
 - Engage a Professional Engineer licensed in the State of New York to prepare details of bracing, sheeting, sheet piling, shoring, and other construction required for protection of excavations or existing structures to remain and support of adjacent properties or buildings. These drawings shall be submitted to the Architect/Engineer of Record for general review, which does not relieve the Contractor's Engineer of responsibility for the adequacy of the design.

- 2. Materials: Provide shoring and bracing material that will support loads imposed. Materials need not be new, but in serviceable condition. If wood is part of shoring system, use approved pressure-preservative treated materials.
- 3. Installation
 - a. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
 - b. Repair or replace, as acceptable to the Owner, adjacent Work damaged or displaced through the installation or removal of shoring and bracing work.
 - c. If at any time the safety of any adjacent building or structure shall appear to be endangered, the Contractor shall cease operations, and at the Contractor's own expense, take all proper means to support such building or structure and shall not resume operations until permission has been secured in writing from the Owner.
 - d. The Contractor shall take every precaution to guard against the movement, settlement or collapse of adjacent property, and shall promptly repair such damage.
- 4. The work of demolition shall be carried out in a thorough and workmanlike manner. The Contractor shall provide all materials, labor and machinery necessary and shall place proper and sufficient guard and fences and warning signals by day and night for the prevention of accidents. The Contractor shall indemnify and save harmless the Owner and Architect/Engineer, its officers, agents and servants and each of them against any and all suits and actions, claims and demands of every name and description brought against it, them, or any of them against and from all damage and costs to which it, they or any of them may be put by reason of injury to the person or property of another, resulting from negligence or carelessness in the performance of the Work, or in guarding the same, or from any improper or defective material or machinery, implements, or appliances used in the removal of said buildings.
- 5. All reasonable precautions shall be taken against fire throughout all the Contractor's operations. The amount of flammable material shall be reduced to a minimum consistent with the proper handling and storing of materials. Provisions shall be made for the extinguishing of fires, as required by the Fire Department. The Contractor shall not permit any fires to be built or open salamanders to be used in any part of the Work.

3.05 DEMOLITION, GENERAL

- A. By beginning Work, the Contractor shall be deemed to have visited the site and accepts conditions as is and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.
- B. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- C. 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 use means, methods, techniques or procedures which would induce undo vibration into any element of the structure. Stop operations immediately if adjacent structures appear to be in danger. Notify the Architect/Engineer and Owner immediately. Do not resume operations until directed by Owner.
 - 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. Obtain written permission from adjacent property Owners when demolition equipment will traverse, infringe upon, or limit access to their property.
- 4. Comply with governing regulations and these Specifications pertaining to environmental protection.
- D. Explosives: The use of explosives, fire, ball and chain and other methods not approved by the local ordinances is prohibited.
- E. Removal, renting, transportation, storage and disposal of flammable, toxic, and corrosive substances, if any, shall be done in strict compliance with governing regulations before proceeding with building demolition.
- F. Demolish all of the material of the buildings, entrance steps, structures, asphalt and concrete paving, apparatus, fixtures, conduits, foundation, stoops, basement slabs, railings, flues, storage tanks and basins on or under the site, and all such items extending beyond the building lines, except the sidewalks, curbs and trees at street of such building unless noted otherwise.
- G. Perform demolition in a systematic manner, beginning at the top of the structure and proceeding to lowest basement floor. Demolish concrete and masonry in small sections. Complete demolition above each floor level before disturbing supporting members on lower levels. The main beams and columns of the structure are to be disturbed last and in a manner which will not cause collapse of adjacent areas. Do not overload supporting members with demolition debris.
- H. Do not place demolition equipment in buildings where it will create excessive loads on supporting walls, floors, and framing. Promptly remove accumulated debris and materials.
- I. Lower structural framing members to ground by hoist or crane.
- J. Perform cutting of existing concrete and masonry construction with saws and core drills.
- K. Remove floors over basement construction and remove on-grade slabs. Break lowest basement slabs to less than 3 feet in any dimension. Foundation walls and footings shall be removed in their entirety.
- L. Remove any below grade combustible material, glass, metal, wood, trash, frozen materials, roots, and other organic matter.
- M. Remove pavements, portions of curbs, slabs on grade, and fences within the Contract Limit Line (CLL), unless shown or directed otherwise after building demolition has been completed.
- N. Do not drop demolished debris or material from any height of building or scaffolding without the use of a proper demolition disposal chute.
- O. The free falling of the chimney walls is not permitted.
- P. Immediately remove all excess debris resulting from the operations under this Contract from the site, do not store or permit to accumulate on the site. If the Contractor fails to remove excess debris promptly, the Owner reserves the right to have it removed from the site at the expense of the Contractor.
- Q. Routine Cleaning: The Contractor shall keep adjacent streets and properties free of dirt, dust and debris produced by demolition at all times.
- R. Demolish indicated existing buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

- 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
- 2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
- 3. Maintain adequate ventilation when using cutting torches.
- 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

3.06 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building 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 descent.
 - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 1. Remove below-grade construction, including basements, foundation walls, and footing, completely.
- D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within the entire site outside footprint indicated for new construction.
 - 1. Contractor shall completely remove all utilities from the existing building including those below ground and the existing slab. Provide temporary services during interruptions to existing utilities as required to perform the Work of this Contract.
 - 2. The Contractor shall withdraw and remove all abandoned water taps and old service mains and provide inserted brass plugs in the main water pipe in the streets in compliance with the rules and regulations of the Department of Environmental Protection and the utility company having jurisdiction. Contractor shall furnish to the Owner a certificate from the utility company having jurisdiction certifying that the Work has been properly performed.
 - 3. The Contractor shall remove all house connections to the main sewer in the streets and the openings in the main sewer shall be properly closed in compliance with the directions of the Department of Environmental Protection and Haverstraw Joint Regional Sewer District. Contractor shall furnish to the Owner a certificate from the utility company having jurisdiction certifying that the Work has been properly performed.
 - 4. The Contractor shall remove all gas services back to the main gas lines in the streets and the openings in the main gas lines shall be properly closed in compliance with the directions of the utility company having jurisdiction. Contractor shall furnish to the Owner a certificate from the utility company having jurisdiction certifying that the Work has been properly performed.
 - 5. The permits for all openings in streets shall be obtained by and at the expense of the Contractor. The Contractor shall pay for all openings in streets and sidewalks, and for repair of such openings, and the Work shall comply with the rules and regulations of the AHJ.
 - 6. Electric, telephone and other wires shall be disconnected in strict accordance with the rules and regulations of the AHJ and of the company or companies having jurisdiction, control or ownership of such utilities.
- E. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section(s) 312000 EARTH MOVING and 312323 FILL.
 - 1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 - 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

- F. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
 - 1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 - 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.07 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with Controlled Fill as required by the Structural Construction Documents. according to backfill requirements in Section(s) 312000 EARTH MOVING, 312317 BACKFILLING, and 312323 FILL. Soils and compaction shall be tested by an independent testing laboratory, refer to Division 31. A report of test results shall be sent to the Owner and Contractor.
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of off-site.. Contractors shall make every effort to re-cycle construction debris on-site.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.09 FIELD QUALITY CONTROL

- A. The construction and installation of all scaffolding, sheeting, shoring and bracing required for or affecting the support and adjacent properties or buildings is subject to Controlled Inspection.
- B. It shall be the design Engineer's responsibility to certify in writing that all scaffolding, sheeting, shoring and bracing was installed in accordance with the approved submittals.

3.10 CLEANING

- A. Upon completion of Work under this Contract, the Contractor shall remove all tools and materials, apparatus, rubbish and debris and shall leave the premises clean, neat and orderly.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION

1.01 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. Underslab vapor retarder.
 - 8. Insulation.

1.02 REFERENCES

- A. ACI 117 Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 Specifications for Concrete Construction; 2020.
- D. ACI 302.1R Guide to Concrete Floor and Slab Construction; 2015.
- E. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R Guide to Hot Weather Concreting; 2020.
- G. ACI 306R Guide to Cold Weather Concreting; 2016.
- H. ACI 308R Guide to External Curing of Concrete; 2016.
- I. ACI 318 Building Code Requirements for Structural Concrete; 2019, with Errata (2021).
- J. ACI 347R Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- K. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- L. ASTM A767/A767M Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.
- M. ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2022.
- N. ASTM A184/A184M Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2019.
- O. ASTM C1059/C1059M Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

- P. ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
- Q. ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.
- R. ASTM C150/C150M Standard Specification for Portland Cement; 2022.
- S. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete; 2020.
- T. ASTM C172/C172M Standard Practice for Sampling Freshly Mixed Concrete; 2017.
- U. ASTM C173/C173M Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- V. ASTM C192/C192M Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2019.
- W. ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- X. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.
- Y. ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2022.
- Z. ASTM C33/C33M Standard Specification for Concrete Aggregates; 2018.
- AA. ASTM C330/C330M Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.
- AB. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.
- AC. ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).
- AD. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2022.
- AE. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete; 2022.
- AF. ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars; 2018a.
- AG. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- AH. ASTM D2103 Standard Specification for Polyethylene Film and Sheeting; 2015.
- AI. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.
- AJ. ASTM D448 Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2017).

- AK. ASTM E1155 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.
- AL. 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; 2018a.
- AM. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.
- AN. AWS D1.4/D1.4M Structural Welding Code Steel Reinforcing Bars; 2018, with Amendment (2020).
- AO. PS 1 Structural Plywood; 2009 (Revised 2019).
- AP. ACI 350 Concrete Sanitary Engineering Structures.
- AQ. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement.

1.03 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.

1.04 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.
- 1.05 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.

1.06 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.

1.07 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.

1.08 REGULATORY REQUIREMENTS

A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

1.09 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 NON-PENETRATING ROOFTOP SUPPORT SYSTEMS.

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. 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.
- E. 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 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Galvanized Reinforcing Bars: ASTM A615/A615M, Grade 60; ASTM A706/A706M, deformed bars; ASTM A767/A767M, Class II zinc coated after fabrication and bending.
- C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.

2.03 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.

2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 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.

2.05 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.

2.06 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. <u>Products</u>: 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. <u>Reef Industries, Inc.</u>; 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.

2.07 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.

2.08 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. Waterstops: Polyvinylchloride; 6 inches wide; heat sealed joints; Styles 705 and 723, as manufactured by GREENSTREAK, or equal.
- H. 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.

 Waterstop-Strip: Strip applied hydrophilic swelling rubber waterstop for concrete and pipe penetrations comprised of thermoplastic elastomer rubber, red color, with a bulk density of 1.25 g/dm3, 0.2 inches by 0.78 inches in size. Material creates an expansive pressure of 1.06 N/mm2 in use. Manufacturer: AQUAFIN Inc.; (410)392-2300; email: info@aquafin.net or Architect approved equivalent. At elevator pit pennetrations.

2.09 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 C39/C39M.

2.10 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.
- 2.11 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 211.1 and 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.
 - 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.

2.12 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.
- B. All concrete for the clear-well and backwash waste tank construction shall include Krystol Internal Membrane (KIM)® integral water repellent admixture as manufactured by Kryton or specifically approved equal. Admixture shall be added at a rate as recommended by the approved manufacturer.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 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.
 - 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 though 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.
 - 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 & SUBRADE PREPARATION

- 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 6" min. (Geotech report requirements to supersede this requirement) 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 overly 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 t 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.
 - 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. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
- F. 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.
- G. 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.
- H. 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.
 - 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.
- 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.
- 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

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 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. Floated Finish: (Apparatus bays, mezzanines and adjacent rooms)
 - 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. 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. See Paragraph 3.03 for additional tolerance requirements. The more stringent tolerance dictates.
 - 4. These slabs should be finished with a mild, soft broom finish in the direction of drainage.
 - a. The Contractor will prepare a 24" x 24" test panel or similar sample of the finish for approval by the Owner and Architect.
 - b. Said sample will remain on the job site during finishing operations and will be used as a guide for the slab finish.
- 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. For exposed to view concrete slabs, give slab surface a second steel troweling to a burnished finish, uniform in texture and appearance. 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 & 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.
 - 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.
 - 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. Repair of Formed Surfaces (Walls).
 - 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, color and/or class as original 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.
- C. 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

1.01 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the Subcontract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes:
 - 1. Grout for uses other than masonry.
 - 2. Pressure Grouting.
- C. Related Sections:
 - 1. Division 01 Section "General Requirements."

1.02 REFERENCES

- A. General:
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. ASTM International:

- 1. ASTM C33 Concrete Aggregates
- 2. ASTM C40 Organic Impurities in Fine Aggregates for Concrete
- 3. ASTM C88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- 4. ASTM C117 Material Finer Than 75µm Sieve in Mineral Aggregates by Washing
- 5. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
- 6. ASTM C150 Portland Cement
- 7. ASTM C289 Potential Reactivity of Aggregates (Chemical Method)
- 8. ASTM C494 Chemical Admixtures for Concrete
- 9. ASTM C881 Epoxy-Resin-Base Bonding Systems for Concrete
- 10. ASTM D2419 Sand Equivalent Value of Soils and Fine Aggregate
- 11. ASTM E329 Inspection and Testing Agencies for Concrete, Steel, Bituminous Materials as Used in Construction

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 SUBMITTALS.
- B. Manufacturer's data shall be provided for bonding compounds, dry pack, nonshrink, pressure grout, retardants, epoxy grout, and polymer concrete.
- C. Test reports, accompanied by a manufacturer's statement that previously tested material is of similar type, quality, and manufacture as that which is proposed for use on this projects, shall be submitted for:
 - 1. Cement.
 - 2. Aggregates.
 - 3. Retardants.

- 4. Bonding compounds.
- 5. Epoxy resin.
- D. The subcontractor's testing laboratory shall provide evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards and evidence of correction of deficiencies noted in the inspection report before materials specified in this section are delivered to the job site.

1.04 QUALITY ASSURANCE

A. Conformance with the specified requirements will be demonstrated testing performed by an independent testing laboratory retained by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Portland cement shall be ASTM C150/C150M, Type II or Type V, 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 sand or crushed stone conforming to ASTM C33/C33M as modified herein. When tested in accordance with ASTM C136/C136M, gradation shall be such that 100 percent by weight passes a standard No. 8 sieve and not less than 45 percent by weight pass a standard No. 40 sieve. Variation from the specified gradation in individual tests will be accepted if the average of three consecutive tests is within the following variation:

| Standard Sieve | Permissible variation in individual test |
|-------------------|--|
| No. 30 or coarser | 2 percent by weight |
| No. 50 or finer | 0.5 percent by weight |

C. Admixtures:

- 1. Water Reducing Retarder: Water reducing retarder shall comply with ASTM C494/C494M, Type D and shall be Master Builders Pozzolith 300-R, Sika Corporation Plastiment or approved equal.
- 2. Lubricant: Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or approved equal.

D. Water:

1. Waste for washing aggregate, for mixing and for 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 SO4, 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.

2.02 GROUT

- A. Drypack Grout:
 - 1. Drypack grout shall be one of the following:
 - a. a mixture of approximately one part cement, 1-1/2 parts sand, water reducing retarder and sufficient water to make a stiff workable mix.

- b. W.R. Meadows Wedjroc Dry Pack.
- c. Euclid Chemical Dry Pack.
- d. or approved equal.
- B. Cement Grout:
 - 1. Cement grout shall be a mixture of one part cement, two parts sand proportioned by volume admixtures for pressure grouting and sufficient water to form a workable mix.
- C. Nonshrink Grout:
 - 1. Nonmetallic aggregate nonshrink grout shall be one of the following:
 - a. U.S. Grout Five Star grout.
 - b. Master Builders Masterflow 713.
 - c. Burke Company Non-Ferrous, Non-Shrink Grout.
 - d. or approved equal.
- D. Epoxy Grout for Crack Repair and Dowel Anchorage:
 - 1. Except for applications involving pressure grouting or crack injection, epoxy shall be a high modulus, moisture insensitive, two component, 100 percent solids, thermosetting modified polyamide epoxy compound. The material shall conform to ASTM C881/C881M, Type I, Grade 3 such as Sika Corporation Sikadur Hi-Mod series, Adhesive Technology Corporation Solidbond 200, or approved equal which is capable of not sagging in horizontal or overhead anchoring applications.
 - 2. Epoxy for applications involving pressure grouting or crack injection, shall be a high modulus, moisture insensitive, two component, injection grade, 100 percent solids blend of epoxy resin compounds. The material shall conform to ASTM C881/C881M, Type I, Grade 1 such as Sika Corporation Sikadur 52, Adhesive Technology Corporation SLV 300 series, or equal which is capable of achieving complete penetration of hairline and larger cracks.
- E. Polymer Concrete for Resurfacing and Patching:
 - 1. Polymer concrete shall consist of a liquid binder and dry aggregate mixed together to make a flowable mortar. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two component epoxy resin compound. The binder material shall conform to ASTM C881/C881M, Type 3, Grade 1 such as Sika Corporation Sikadur Lo-Mod series, Adhesive Technology Corporation 400 series, or equal with a consistency similar to light weight oil for proper mixing with the aggregate. The aggregate shall be oven dry, kept in sealed packages until the time of mixing and be of size and consistency compatible with recommendations of the manufacturer of the liquid binder for the intended application.
- F. Adhesive Resin for Dowel Anchorage:
 - ICC approved, structural epoxy; prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed at nozzle. Subject to compliance with current ICC evaluation report provide one of the following: HIT RE500-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-2322), HIT-HY 200 MAX-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-3013), SET-XP Adhesive Anchoring Systems, Simpson Strong-Tie Co. (ICC ESR-2508).

2.03 PRESSURE GROUTING EQUIPMENT

A. Pressure grouting equipment shall include a mixer and holdover agitator tanks designed to place grout at pressures up to 50 psi (0.345 MPa). Gauges indicating grouting pressure shall be provided and the mixer shall be equipped with a meter capable of indicating to within 1/10 cubic foot (0.003 m³) the volume of grout placed.

PART 3 EXECUTION

3.01 GENERAL

A. Bonding compounds for use with grout is specified in Section 033000 - CAST-IN PLACE CONCRETE. Primer, if required for polymer concrete, is to be provided and installed per the manufacturer's recommendations.

3.02 DRYPACK GROUT

- A. Drypack grout is to be used for built-up surfaces, setting miscellaneous metal items and minor repairs.
- B. Surfaces required to be built-up with drypack grout are to be roughened by brushing, cleaned and coated with the bonding compound before application of grout. The grout is to be applied to the required thickness and cured in accordance with Section 033000 CAST-IN PLACE CONCRETE.

3.03 CEMENT GROUT

- A. Cement grout is to be used for filling nonbearing portions of equipment pads and pressure grouting.
- B. Except for the specialized requirements for pressure grouting, grout is to be mixed and placed in the same manner as cast-in-place concrete. Grout is to be mixed for at least one minute and diluted grout is to agitated until placed.

3.04 NONSHRINK GROUT

- A. Nonshrink, nonmetallic aggregate grout is to be used under equipment, bearing plates and column base plates. Nonshrink, metallic aggregate grout is to be used under rotating equipment where high strength and fatigue are of concern, to grout anchor bolts and to grout reinforcing steel. Grout is to be placed and cured in accordance with the manufacturer's recommendations.
- B. Holes required for grouting shall be blown clean with compressed air and are to be free of dust or standing water. Horizontal holes for grouting are to be drilled at a slight downward angle and with the inserted dowel or bolt bent to match.

3.05 EPOXY GROUT

- A. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity, repairing structural concrete and may be used for setting dowels or bolts in holes. Concrete is to be primed in accordance with the grout manufacturer's recommendations.
- B. The use of epoxy grout must comply with the following restrictions:
 - 1. Limited to areas where exposure, on an intermittent or continuous basis, to acid, chlorine gas or to machine or diesel oils, is extremely unlikely.
 - 2. Limited to applications where exposure to fire or to concrete temperatures above the product heat deflection temperature or 120 deg F (40 deg C)(whichever is less) is extremely unlikely. Overhead applications are not allowed.
 - 3. Holes for the anchors shall be drilled (not cored), shall be blown clean with compressed air and shall be free of dust or standing water.
 - 4. The anchor type, size and embedment depth shall be as shown on the drawings and the anchor must be installed in accordance with the manufacturer's recommendations.
 - 5. The anchor must not be loaded until after the full curing period has elapsed.

3.06 PRESSURE GROUTING

A. Prior to grouting, cracks and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids. Once started, grouting shall be continuous until completed. In case of a mechanical failure or other stoppage of the work, the grout equipment shall be washed out sufficiently to ensure that fresh only grout is pumped when the work is restarted.

3.07 FIELD QUALITY CONTROL

- A. The Testing Laboratory will:
 - 1. Special Inspect installation of anchors in accordance with applicable ICC Evaluation Report, where special inspection is indicated on Contract Documents or where Subcontractor's design engineer has used ICC anchor capacities that require Special Inspection.
 - 2. Subcontractor will reimburse Owner for cost of Special Inspection, where anchors are sized by Subcontractor's design engineer using ICC Special Inspection values.
 - 3. Develop and utilize an effective method of field marking anchor and dowel test locations and results.
- B. Testing of grout mixes for conformance to manufacturer's specified strength: The Owner's independent testing laboratory shall take four test samples of each day's grout mix and test grout mix samples at 7 and 28 days. Test reports shall be submitted to the Owner / Architect for review under the provisions of Division 01 Section "General Requirements."
- C. Test 25 percent of reinforcing steel dowels installed with adhesive resin on a given day in tension using pullout procedure. Test to 80% of specified yield strength of the dowel or 150% of the ICC rated static capacity whichever is the lesser with special inspection. Dowels specifically noted on the drawings as "No test required" do not require tension testing.
- D. If the failure rate of dowels exceeds 10 percent, testing will be increased to 100 percent of that day's installation of similar anchors or dowels. Testing will be reduced to 25 percent of that day's installation when the failure rate is reduced to 10 percent or less. Failed dowels will be replaced at no additional cost to the Owner. Subcontractor will reimburse Owner for cost of additional testing. The testing agency will produce daily reports of all testing activities: copies of daily reports will be submitted to the Owner / Architect in a timely manner.

END OF SECTION

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. Face brick.
 - 2. Mortar and grout.
 - 3. Ties and anchors.
 - 4. Miscellaneous masonry accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
- C. Samples for Initial Selection:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Colored mortar.
- D. Samples for Verification: For each type and color of the following:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - 2. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 3. Anchors, ties, and metal accessories.
- B. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

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 single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
 - 1. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

- 2. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- 3. ASTM A580/A580M Standard Specification for Stainless Steel Wire; 2018.
- 4. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- 5. ASTM A951/A951M Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016, with Editorial Revision (2018).
- 6. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- 7. ASTM C144 Standard Specification for Aggregate for Masonry Mortar; 2018.
- 8. ASTM C150/C150M Standard Specification for Portland Cement; 2022.
- 9. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- 10. ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2022.
- 11. ASTM C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2017.
- 12. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- 13. ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- 14. ASTM D1056 Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for each type of exposed unit masonry construction in sizes approximately 60 inches long by 48 inches high by full thickness, including accessories.
 - a. Include a sealant-filled joint at least 16 inches long in mockup.
 - b. Include through-wall flashing installed for a 24 inch (600-mm) length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12 inch length of flashing left exposed to view (omit masonry above half of flashing).
 - c. Include metal studs, sheathing, building wrap, veneer anchors, flashing, cavity drainage material, and weep holes in mockup.
 - 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 - 4. Protect accepted mockups from the elements with weather-resistant membrane.
 - 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- D. 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.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. 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/ERTA/ASCE 6/TMS 602.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ERTA/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.02 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C216.

- 1. Products: Subject to compliance with requirements, provide the following:
 - a. Factory of Manufacturing: Belden Brick Company.
 - b. Size shall be 3-5/8" bed depth x 2-1/4" face height x 7-5/8" face length. unless otherwise noted. For assistance, contact: Ken Johnson - Belden Tri-state Building Materials: 337 7th Ave, 5th Floor, New York, NY 10001. Tel.: 347-723-9428.
 - c. Architect approved equivalent.
 - d. Texture: Velour Texture.
 - e. Grade: SW.
 - f. Type: FBX
- 2. 24-hour cold weather absorption shall not exceed 4.10. 5-hour cold weather absorption not to exceed 5.7.
- 3. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
- 4. Compression strength shall have a minimum average requirement of 14,340 psi.

2.03 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type N.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- E. Colored Cement Product: Packaged blend made from Portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Colored Portland Cement-Lime Mix
 - 1) <u>Westbrook Concrete Block Co. Inc.;</u> Premixed Mortar
 - 2) Or Architect Approved Equal.
 - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 3. Pigments shall not exceed 10 percent of Portland cement by weight.
 - 4. Pigments shall not exceed 5 percent of masonry cement by weight.
- F. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

2.04 REINFORCEMENT

- A. Masonry Joint Reinforcement, General: ASTM A951/A951M.
- B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187 inch (4.75 mm) diameter, hot-dip galvanized, carbon-steel continuous wire.

2.05 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A153/A153M, Class B-2 coating.
 - 2. Stainless-Steel Wire: ASTM A580/A580M, Type 304.
 - 3. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 - 4. Stainless-Steel Sheet: ASTM A666, Type 304.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 - 2. Thermal Wing Nut Anchor for CMU Construction: 2-Seal reinforced flame-resistant plastic Wing Nut Anchor with 1 1/2 inch diameter Type 304 Stainless Steel / bonded EPDM washer to seal against insulation and secure insulation to backup. Additional washer on Anchor barrel seals against the Air Barrier. Length of each Anchor shall be as required by the detailed sheathing and insulation depths. Each anchor shall be provided with a Hot-Dip Galvanized, 3/16 inch diameter Compressed Leg 2X-Hook with offsets as required to provide a minimum of 2 inch engagement of the masonry veneer. Space 16 inches on center in each direction maximum or less if indicated on the drawings.
 - a. Manufacturer:
 - 1) Hohmann & Barnard, Inc.
 - 2) Or Architect approved equal.
 - b. For Seismic requirements, provide 3/16 inch diameter continuous Hot-Dip Galvanized wire in conjunction with the 2X-HOOK Seismic Pintle.
 - 3. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B117.

2.06 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 - 1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Mortar Net USA, Ltd.; Total Flash.
 - 2) Or Architect approved equal.

- b. Monolithic Sheet: TPO Elastomeric thermoplastic flashing, 0.040 inch (1.0 mm) thick with integral stainless steel drip edge, drainage matrix, stainless steel termination bar with #14 x 2" fasteners at 6" o.c., integral weeps.
- c. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
 - 4. Where flashing is fully concealed, use flexible flashing.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Weep/Vent Products: Use one of the following unless otherwise indicated:
 - 1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected by the Architect from manufacturer's standard.
 - a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) <u>Mortar Net USA, Ltd</u>.; Mortar Net Weep Vents.
 - 2) <u>CavClear;</u> Weep Vents.
 - 3) Or Architect approved equal.

2.08 MASONRY CLEANERS

- A. 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 cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 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. EaCo Chem, Inc.
 - b. ProSoCo, Inc.

2.09 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar.
 - 2. Use Portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
 - 1. Products;
 - a. Westbrook Concrete Block Co. Inc.: Premixed Mortar.

- b. Or Architect approved equal.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of Portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints with the following units: a. Face brick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, 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 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet , 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch (12 mm) maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m) or 1/2 inch (12 mm) maximum.
- 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch; do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
 - 2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
 - 3. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings or foundation walls.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.06 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally.

3.07 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten anchors with metal fasteners of type indicate as specified by manufacturers. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Maximum vertical offset of bed joints from one wythe to the other shall be 1 1/4 inch when utilizing adjustable wall ties such as pintle ties.
 - 5. Pintle ties shall have two legs of W2.8 wire size minimum.
 - 6. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches (407 mm) o.c. horizontally, with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

3.08 EXPANSION JOINTS

- A. General: Install expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form expansion joints in brick as follows:
 - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 - 3. Build in compressible joint fillers where indicated.
 - 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 JOINT SEALANTS.
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 JOINT SEALANTS, but not less than 3/8 inch (10 mm).
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.09 LINTELS

- A. Install galvanized steel lintels where indicated on drawings.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. For Total Flash System at base of wall: Install as directed by manufacturer.
 - 2. At lintels, extend flashing a minimum of 8 inches (204 mm) into masonry at each end. At heads and sills, extend flashing 8 inches at ends and turn up not less than 2 inches to form end dams.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
- E. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Leave the side of the masonry units forming the vent space un-buttered and clear of mortar. Install with notched side down. Slide vent material into joint as the two masonry units forming the weep vent are placed.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

- 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
- 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
- 5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
- 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor'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 and masonry cut-offs by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
 - 2. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- C. Legally dispose of off-site, any excess masonry waste.

END OF SECTION

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. Concrete masonry units.
 - 2. Masonry Lintels.
 - 3. Mortar and grout.
 - 4. Steel reinforcing bars.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Cavity Drainage System.
 - 9. Miscellaneous masonry accessories.
 - 10. Installation of Door Frames, Lintels and items furnished by other sections.
 - 11. Cleaning of masonry.

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.
- B. Fire Rated Assemblies: Tested in accordance with ANSI/UL 263 "Fire Tests of Building Construction and Materials" conforming to UL Assembly No. U906.

1.05 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C140/C140M for compressive strength.
 - Mortar Test (Property Specification): For each mix required, according to ASTM C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.
 - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C780 for compressive strength.
 - 4. Grout Test (Compressive Strength): For each mix required, according to ASTM C1019.
 - 5. Prism Test: For each type of construction required, according to ASTM C1314.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
 - 1. Colored mortar.
 - 2. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
 - 1. Exposed CMUs.
 - 2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 3. Accessories embedded in masonry.

1.07 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties material test reports substantiating compliance with requirements.
 - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.
 - 6. Joint reinforcement.
 - 7. Anchors, ties, and metal accessories.
- D. 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 C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.
 - 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in <u>ACI 530.1</u>/ASCE 6/TMS 402/602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.08 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- 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. Special Testing Inspections: Owner shall employ a Special Inspection Agency to provide required inspections in accordance with current Building Code of New York State.
- D. 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.
- E. 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 single source from single manufacturer for each product required.
- F. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- G. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 402/602 unless modified by requirements in the Contract Documents.
 - 1. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.
 - 2. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2020.
 - 3. ASTM E514/E514M Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.
- H. Mock-up Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014500 QUALITY CONTROL for mockups.
 - 1. Build sample panels for typical exterior wall in sizes approximately 72 inches long by 48 inches high by full thickness.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Approval of sample mock-up panel is for the following items:
 - a. Color, texture, and blending of masonry units;
 - b. Relationship of mortar and sealant colors to masonry unit colors;
 - c. Tooling of joints;
 - d. Aesthetic qualities of workmanship;
 - e. Reinforcing, flashing, control joint and sealant installations;
 - f. Other material and construction qualities specifically requested by Architect in writing.

5. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. 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.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. 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.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. 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 402/602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in <u>ACI 530.1</u>/ASCE 6/TMS 402/602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products : Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) <u>ACM Chemistries, Inc.;</u> RainBloc.
 - 2) BASF Group; MasterPel 240
 - 3) <u>Grace Construction Products, W. R. Grace & Co.;</u> Dry-Block.
- D. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi(19.3 MPa).
 - 2. Density Classification: Normal weight.
 - 3. Size: Manufactured to dimensions 3/8 inch less than nominal dimensions. Provide in sizes indicated on the drawings.
 - 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample or as indicated on the drawings.
 - 5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.03 MASONRY LINTELS

- A. General:
 - 1. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2. Steel Lintels: Install multiple Steel angle lintels as indicated on the drawings. Provide Hot-dip galvanized lintels for exterior installations.

2.04 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C91/C91M.
 - 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. Essroc, Italcementi Group; Brixment or Velvet.
 - b. Holcim (US) Inc; Mortamix Masonry Cement.
 - c. Lafarge North America Inc.; Magnolia Masonry Cement.
 - d. Lehigh Cement Company; Lehigh Masonry Cement.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 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. <u>Davis Colors;</u> True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
- G. Colored Cement Product: Packaged blend made from Portland cement and hydrated lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
- H. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Grout: ASTM C476. 2,000 psi minimum
 - 1. Fine aggregate: sand.
 - 2. Coarse aggregate: 3/8" chip gravel
- J. Aggregate for Grout: ASTM C404.
- K. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

- 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. Euclid Chemical Company (The); Accelguard 80.
 - b. <u>Grace Construction Products, W. R. Grace & Co.;</u> Morset.
 - c. <u>Sonneborn Products, BASF Aktiengesellschaft;</u> Trimix-NCA.
- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same 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. <u>ACM Chemistries, Inc.;</u> RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; MasterPel 240MA Mortar Admixture.
 - c. <u>Grace Construction Products, W. R. Grace & Co. Conn.</u>; Dry-Block Mortar Admixture.
- M. Water: Potable.

2.05 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
- B. Epoxy coated reinforcement shall conform to ASTM A775/A775M.
- C. Masonry Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Mill- galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 0.187-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.187-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.06 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A153/A153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm)of masonry face, made from 0.187-inch diameter, hot-dip galvanized steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

- 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch thick, steel sheet, galvanized after fabrication 01.05-inch thick, steel sheet, galvanized after fabrication.
 - a. 0.108-inch thick, galvanized sheet may be used at interior walls unless otherwise indicated.
- 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.
- 3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 01.05-inch thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
- D. Partition Top anchors:
 - 1. PTA type, Model 420 by Hohmann & Barnard, Inc. or approved equal, 0.105-inch thick metal plate with 3/8-inch diameter stainless steel rod, Type 304, 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Use in conjunction with NS Neoprene Sponge to allow for vertical expansion and contraction.
- E. Rigid Anchors for intersecting walls: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.07 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: L-shaped steel bolts complying with ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153/A153M, Class C; of dimensions indicated.
- D. Post-installed Anchors: chemical anchors.
 - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5 unless otherwise indicated.
 - 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 A1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.08 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 - 2. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) <u>Cheney Flashing Company</u>; Cheney 3-Way Flashing (Sawtooth).

- 2) <u>Keystone Flashing Company, Inc;</u> Keystone 3-Way Interlocking Thruwall Flashing.
- 3) <u>Sandell Manufacturing Co.</u>, Inc; Mechanically Keyed Flashing.
- 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
- 4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- 5. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- 6. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 - 1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Mortar Net USA, Ltd.; Total Flash.
 - 2) CavClear Masonry Mat; MasonPro, Inc.
 - 3) Or approved equal.
 - 4) Monolithic Sheet: TPO Elastomeric thermoplastic flashing, 0.040 inch thick with integral stainless steel drip edge, drainage matrix, integral weeps, stainless steel termination bar and #14 x 2 Stainless fasteners spaced 6" apart.
 - 5) Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with a metal drip edge.
 - 4. Where flashing is fully concealed, use flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 SHEET METAL FLASHING AND TRIM.
 - 1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Solder for Copper: ASTM B32, Grade Sn96, 96 percent tin and 4 percent silver.
 - 3. Elastomeric Sealant: ASTM C920, chemically curing urethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.09 WEEP VENTS

- A. Manufacturer and Type: CavClear Weep Vents as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
 - 1. Description: Non-woven mesh with notched bottom.
 - 2. Color: as selected by the Architect from the manufacturer's full color offering to match mortar.
 - 3. Size: 3/8 inch by size to match masonry unit dimensions.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- E. Single Wythe Cavity Weep units: Provide continuously in base joint of single wythe masonry installations. Units shall be Cavity Weep TM CV 5010 as manufactured by MTI or approved equal.
- F. Grout Stop: Provide Hohmann & Barnard, Inc. HGS Mortar / Grout Screen or approved equal; ASTM D5034, non-corrosive, high strength 1/4 inch mesh polypropylene monofilament screening in widths conforming to CMU units. Cut away as required to allow grout flow at reinforced core locations.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use Portland cement-lime masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use Portland cement-lime masonry cement mortar.
 - 4. For reinforced masonry, use Portland cement-lime masonry cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type N.
 - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

- 1. Pigments shall not exceed 10 percent of Portland cement by weight.
- 2. Mix to match Architect's sample.
- 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Architectural CMUs.
 - b. Cast stone trim units.
- E. 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 Architect's sample.
 - 2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
 - a. Architectural CMUs.
 - b. Cast stone trim units.
- F. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in <u>ACI 530.1</u>/ASCE 6/TMS 402/602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi(14 MPa).
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch .

- 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
- 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet or 1/2 inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. 3 mm.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond unless indicated otherwise on the Contract Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

- H. 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. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 FIRE-RESISTIVE JOINT SYSTEMS.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. 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.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.07 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

- 1. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
- 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
- 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.08 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Control Joint Locations:
 - 1. At major changes in wall height.
 - 2. At changes in wall thickness.
 - 3. At control joints in foundations, roofs and floors.
 - 4. At chases and recesses for piping, columns, fixtures, etc.
 - 5. At one side of wall openings less than 6 feet unless indicated otherwise.
 - 6. At both sides of wall opening exceeding 6 feet.
 - 7. At or near wall intersections.
 - 8. Near return wall angles in L, T, and U shaped structures.
 - 9. All other cases, maximum spacing between joints shall not exceed 30 feet.

3.09 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING

- A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. 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 bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

- 3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
- 4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 JOINT SEALANTS for application indicated.
- 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
- 6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- 7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 DRAINAGE MAT INSTALLATIONS

A. Install masonry drainage mat continuously throughout full-height of all exterior masonry cavities during construction of exterior wythe; follow manufacturer's installation instructions. Verify that air space width is no more than 3/8 inch greater than masonry mat thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Use multiple layers at bottom of wall and above through-wall flashings when air space depth exceeds masonry mat thickness by more than 3/8 inch. Extend extra mat at least to top of base flashing. Butt adjacent pieces to moderate contact. Fit to perimeter construction and penetrations without voids.

3.12 WEEP VENT INSTALLATIONS

A. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Leave the side of the masonry units forming the vent space unbuttered and clear of mortar. Install with notched side down. Slide vent material into joint as the two masonry units forming the weep vent are placed.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in <u>ACI 530.1</u>/ASCE 6/TMS 402/602.

- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in <u>ACI 530.1</u>/ASCE 6/TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.
- D. Steel reinforcement bars, unless otherwise detailed on plans, shall be placed as follows:
 - 1. Install #5 bar, vertically at all corners and at door and window jambs and 32" o.c. typical in all 10" walls.
 - 2. Install #5 bar, vertically at all corners and at door and window jambs and 48" o.c. typical in all 12" walls.
 - 3. Fill all concrete masonry unit cells containing reinforcement bars solid with mortar.
 - 4. Remove pre-molded insulation from block cores containing vertical reinforcing bars.
 - 5. 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 |
| | |

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the Building Code of New York State.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140/C140M for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
- I. Prism Test: For each type of construction provided, according to ASTM C1314 at 28 days.

3.15 PARGING

- A. Parge exterior faces of below-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 cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.17 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.
- B. 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

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: Portland cement based manufactured stone veneer and trim.1. Stone masonry adhered to cold-formed metal framing and sheathing.

1.03 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Standard sample board consisting of small-scale pieces of veneer units showing full range of textures and colors.
- C. Samples for Initial Selection: For colored mortar and other items involving color selection.
- D. Samples for Verification:
 - 1. For each stone type indicated. Include at least five Samples in each set and show the full range of color and other visual characteristics in completed Work.
 - 2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.
 - 3. Verification Samples: Following initial sample selection submit "laid-up" sample board using the selected stone and mortar materials and showing the full range of colors expected in the finished Work; minimum sample size: 3 by 3 feet (1m by 1 m).

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Regulatory Requirements: Evaluation reports.
- C. Veneer manufacturer's installation instructions.
- D. Installation instructions for other materials
- E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
 - 1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.
- F. Material Test Reports:
 - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than

2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters familiar with the installation procedures for manufactured veneer products.
- B. Manufacturer Qualifications: Licensee of the approved Manufactured Stone manufacturer.

C. Certifications:

- 1. ICC Evaluation Service Evaluation Report ESR-1215 (Eldorado Stone Products).
- 2. NES Evaluation Service- Evaluation Report NER.
- 3. UL Classification listing in Building Materials Directory.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for typical exterior wall in sizes approximately 60 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include stone coping at top of mockup.
 - b. Include a sealant-filled joint at least 16 inches long in mockup.
 - c. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit stone masonry above half of flashing).
 - d. Include metal studs, sheathing, flashing, and weep holes in exterior masonry-veneer wall mockup.
 - 2. Protect accepted mockups from the elements with weather-resistant membrane.
 - Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 PRECONSTRUCTION TESTING

A. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 - JOINT SEALANTS. Samples of materials that will contact or affect joint sealants.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials as recommended by the manufacturer.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

1.09 FIELD CONDITIONS

- A. Environmental Requirements: When air temperature is 40 degrees F (4.5 degrees C) or below, consult local building code and procedures specified herein for Cold-Weather Construction requirements.
- B. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- C. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.
- D. 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 stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602 /ASCE 6/TMS 602.
 - 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 seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602/ASCE 6/TMS 602.

1.10 COORDINATION

A. Advise installers of other work about specific requirements for placement of flashing and similar items to be built into stone masonry.

1.11 MAINTENANCE MATERIALS

A. Provide 5 percent of the coverage area for units in shapes, colors and sizes.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard warranty coverage against defects in materials when installed in accordance with manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Eldorado Stone, LLC., 1370 Grand Ave., Bldg. B, San Marcos, CA 92069. Tel. (800) 925-1491, Fax (760) 736-8890; email: customerservice@eldoradostone.com.
 - 2. ProVia, 1550 Country Road 140, Sugarcreek OH 44681, Tel. 800.669.4711, www.provia.com

- 3. Boral Cultured Stone, Tel. (800)255-1727, www.culturedstone.com
- 4. or Architect approved equivalent.
- B. Source Limitations for Manufactured Stone: Obtain each variety of stone, from single source with resources to provide materials of consistent quality in appearance and physical properties.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.02 PRODUCTS

- A. Veneer Unit properties: Precast veneer units consisting of portland cement, lightweight aggregates, and mineral oxide pigments.
 - 1. Compressive Strength: ASTM C192/C192M and ASTM C39/C39M, 5 sample average: greater than 1,800 psi (12.4MPa).
 - 2. Shear Bond: ASTM C482: 50 psi (345kPa).
 - 3. Water Absorption: UBC Standard 15-5: Less than 22 percent.
 - 4. Freeze-Thaw Test: ASTM C67: Less than 3 percent weight loss and no disintegration and 2.
 - 5. Thermal Resistance: ASTM C177: 0.473 at 1.387 inches thick.
- B. Product: Veneer stone shall be Pattern: Shadow Rock and Color: Chesapeake.
- C. Moisture Barrier: ASTM D226/D226M, Type 1, No. 15, non-perforated asphalt-saturated felt paper.
- D. Reinforcing: ASTM C847, 3.4lb (1.8 kg/m2) galvanized 3/8" rib lath complying with code agency requirements for the type of substrate over which stone veneer is installed.
- E. Mortar:
 - 1. Cement: Any cement complying with ASTM C270.
 - 2. Lime: ASTM C207.
 - 3. Sand: ASTM C144, natural or manufactured sand.
 - 4. Color Pigment: ASTM C979/C979M, mineral oxide pigments.
 - 5. Water: Potable.
 - 6. Pre-Packaged Latex-Portland Cement Mortar: ANSI A118.4.
- F. Bonding Agent: Exterior integral bonding agent meeting ASTM C932, ASTM C1059/C1059M Type II.
- G. Sealer: Water based silane or siloxane masonry sealer, clear semi-gloss.

2.03 MORTAR MIXES

- A. Standard Installation (Grouted Joints):
 - 1. Mix mortar in accordance with ASTM C270, Type N or S.
 - a. Add color pigment in grout joint mortar in accordance with pigment manufacturer's instructions.
- B. Jointless/Dry-Stacked Installation:
 - 1. Mix mortar in accordance with approved Manufactured Stone Company requirements for mortar preparation instructions.
 - a. Add color pigment in accordance with pigment manufacturer's instructions.

2.04 MORTAR MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Essroc, Italcementi Group; Saylor's Plus.
 - b. Lafarge North America Inc.; Eaglebond.
 - c. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
- E. Colored Portland Cement-Lime Mix: Packaged blend of Portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Lafarge North America Inc.; Eaglebond.
 - b. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - c. Architect approved equivalent.
- F. Colored Masonry Cement Mix: Packaged blend of masonry cement and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 5 percent of masonry cement by weight.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Essroc, Italcementi Group; Flamingo-Brixment.
 - b. Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
 - c. Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
 - d. Architect approved equivalent.
- G. Aggregate: ASTM C144:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
 - 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - a. Match Architect's sample.
- H. Latex Additive: Manufacturer's standard 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 mortar bed, and not containing a retarder.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. ProSpec; Bonsal American; a division of Oldcastle Architectural Products Group.
 - d. Architect approved equivalent.
- I. Water: Potable.

2.05 STONE TRIM ANCHORS

- A. Stone Trim Anchors: Units fabricated with tabs or dowels designed to engage kerfs or holes in stone trim units and holes for fasteners or post-installed anchor bolts for fastening to substrates or framing as indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Heckmann Building Products Inc.
 - b. Hohmann & Barnard, Inc.
 - c. Architect approved equivalent.
- B. Materials: Fabricate anchors from stainless steel, ASTM A240/A240M or ASTM A666, Type 304. Fabricate dowels from stainless steel, ASTM A276/A276M, Type 304.
- C. Fasteners for Stone Trim Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1.
- D. Post-installed Anchor Bolts for Fastening Stone Trim Anchors: Chemical anchors made from stainless-steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 for bolts and nuts; ASTM A666 or ASTM A276/A276M, Type 304 or Type 316, for anchors.

2.06 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: For flashing unexposed to the exterior, use one of the following unless otherwise indicated:
 - 1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded with asphalt between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division ; Copper Fabric Thru-Wall Flashing.
 - 2) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 3) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 4) York Manufacturing, Inc.; York Copper Fabric Flashing.
 - 5) Architect approved equivalent.
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 SHEET METAL FLASHING AND TRIM.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Cementitious Dampproofing: Cementitious formulation recommended by ILI and nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.
- C. Weep Products: Use one of the following unless otherwise indicated:
 - 1. Mesh Weep Holes: Free-draining mesh; made from polyethylene strands, full width of head joint and 2 inches high by thickness of stone masonry; in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
 - 2) Architect approved equivalent.

- D. Expanded Metal Lath: 3.4 lb/sq. yd., self-furring, diamond-mesh lath complying with ASTM C847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G60.
- E. Lath Attachment Devices: Material and type required by ASTM C1063 for installations indicated.
- F. Drainage Plane Units: High impact polystyrene sheets, 0.024 inch thick, formed with corrugations and a spunbond polypropylene fabric, charcoal color, attached to one side with a 4 inch overlapping skirt on one edge; 3/16 inch squared channel depth Sure Cavity TM, SCMM 2516 as manufactured by MTI- Masonry Technology Incorporated, Tel. 800-879-3348; email: info @mtidry.com.

2.08 FABRICATION

- A. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.
 - 1. Finish for Sills: Smooth.
 - Finish for Copings: Smooth.
 a. Finish exposed ends of copings same as front and back faces.

2.09 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Use Portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
 - 4. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Stone Masonry: Comply with ASTM C270, Property Specification.
 - 1. Mortar for Setting Stone: Type N.
 - 2. Mortar for Pointing Stone: Type N.
- D. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- E. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
 - 1. For latex-modified, portland cement, setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- F. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.

- G. Pigmented Mortar: Use colored cement product.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
- H. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary.
 - 1. Mix to match Architect's sample.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives and only as approved by the manufacturer.
- 3.03 SETTING OF STONE MASONRY, GENERAL
 - A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
 - B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
 - C. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
 - D. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
 - E. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch at narrowest points or more than 5/8 inch at widest points.
 - F. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealing joints is specified in Section 079200 JOINT SEALANTS.
 - G. Install metal expansion strips in sealant joints at locations indicated. Build flanges of expansion strips into masonry by embedding in mortar between stone masonry and backup wythe. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.

- H. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. At stud-framed walls, extend flashing through stone masonry, up sheathing face at least 16 inches, and behind weather barrier.
 - 2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches into masonry at each end.
 - 3. At sills, extend flashing not less than 4 inches at ends.
 - 4. At ends of head and sill flashing, turn up not less than 2 inches to form end dams.
 - 5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 JOINT SEALANTS for application indicated.
 - 6. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 JOINT SEALANTS for application indicated.
 - 7. Extend sheet metal flashing 1/2 inch beyond masonry face at exterior, and turn flashing down to form a drip.
- I. Place weep holes in joints where moisture may accumulate, including above shelf angles and at flashing.
 - 1. Use mesh weep holes to form weep holes.

3.04 CONSTRUCTION TOLERANCES

A. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

3.05 INSTALLATION OF ADHERED STONE MASONRY VENEER

- A. Install and clean stone in accordance with manufacturer's installation instructions for Jointless / Dry-Stacked installation.
- B. Apply sealer in accordance with sealer manufacturer's installation instructions.
- C. Install flashing over sheathing and behind weather-resistant sheathing paper by fastening through sheathing into framing.
- D. Install lath over weather-resistant sheathing paper by fastening through sheathing into framing to comply with ASTM C847.
- E. Install scratch coat over metal lath 3/8 inch thick to comply with ASTM C926.
- F. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.

3.06 ADJUSTING AND CLEANING

- A. Remove and replace stone masonry of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Stone masonry not matching approved samples and mockups.
 - 4. Stone masonry not complying with other requirements indicated.

- B. Replace in a manner which results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- D. Remove protective coverings from adjacent work.
- E. Cleaning Veneer Units:
 - 1. Wash with soft bristle brush and water/granulated detergent solution.
 - 2. Rinse immediately with clean water.
- F. Removing Efflorescence:
 - 1. Allow veneer to dry thoroughly.
 - 2. Scrub with soft bristle brush and clean water.
 - 3. Rinse immediately with clean water; allow to dry
 - 4. If efflorescence is still visible, repeat above procedure using a solution of 1 part household vinegar and 5 parts water.
 - 5. Rinse immediately with clean water.

3.07 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

END OF SECTION

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 "Steel 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 099100 "Painting" 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 Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.

- C. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.
- D. Delegated Connection Designer: Connections not fully detailed or shown with "minimum requirements" 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.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - 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.
- F. 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 in 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: Combined system of moment frame, braced frame, and shear walls.

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 Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- 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 E 165.
- 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 NYS IBC Table 1704.32.
 - 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 099100 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

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. Formed steel cant strips.
 - 4. Pourstop angles, cell closures and end forms to contain wet concrete.
 - 5. Bearing plates and angles
 - 6. Framing for openings up to and including 18 inches.
 - 7. 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.
- 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, "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 L/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.

- 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 E 119; 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.

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. Epic Metals (Toris CA).
 - 3. New Millennium Building Systems (Versa-Dek).
 - 4. Or Engineer approved equal.

- 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 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, gage 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 gage 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 A 780.
- O. Bearing Plates and Angles: ASTM A36 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.

2.04 SOURCE QUALITY CONTROL

- A. Testing and analysis of components will be performed under provisions of Section 014500.
- 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 gage or thinner.
- M. Mechanically fasten male/female side laps at 24 inches on center maximum for decking thinner than 20 gage. Weld male/female side laps at 18 inches on center maximum for decks 20 gage 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 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.
- H. Do not install conduit in concrete slabs.

3.04 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.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 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

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. Exterior stud wall framing.
 - 3. Flat ceiling and attic floor joist framing.
 - 4. Joist framing.

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 Building Code of New York State 2020 IBC with applicable supplements.

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. <u>Dietrich Metal Framing</u> ; a Worthington Industries Company
 - 2. <u>MarinoWARE</u>
 - 3. Or approved equal.

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 A 1003/A 1003M, 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 G-60 coating.
- G. Minimum steel gauges shall be 18 ga. 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 ga..
- 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. 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.
 - 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. <u>Dietrich Metal Framing</u>; a Worthington Industries company.
 - 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.
 - 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 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 A 1003/A 1003M, 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 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.

2.08 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 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: To match stud spacing.

3.05 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.
 - 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.

3.06 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.

3.07 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 A 780 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.

3.08 TOLERANCES

- A. Vertical alignment (plumbness) of studs shall be within 1/8 inch in 10.0 inches (3.175 mm in 3.048 m) of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/8 inch in 10.0 inches 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

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 no 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 bolted to masonry.
 - 17. Angles attached to pipe bollards at water service entrance.
 - 18. Stainless steel sill protection plates.
 - 19. Rope Tie Offs.
 - 20. Interior manhole frame and cover including support plate.
 - 21. Loose steel angles and steel angles bolted to concrete or masonry.
 - 22. Mezzanine edge angles.
 - 23. Stainless steel hooks for bunting.
 - 24. Beams located at training window openings.
 - 25. Guard rails at interior training window openings.
 - 26. Stainless Steel Face Shield Hooks.
 - 27. Stainless Steel Ladder Standoff Bracket.

1.03 RELATED SECTIONS INCLUDE THE FOLLOWING:

- A. Section 033000 Cast-In-Place Concrete
- B. Section 042113 Brick Masonry
- C. Section 042200 Concrete Unit Masonry
- D. Section 051200 Structural Steel Framing
- E. Section 053100 Steel Decking
- F. Section 054000 Cold Formed Metal Framing
- G. Section 055100 Metal Stairs, Handrails and Railings

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016100 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.

H2M

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.

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.

A. Fabricate pipe bollards from Schedule 40 galvanized steel pipe. Provide galvanized steel domed caps for field welding.

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 "J" hook bolt/screw/custom fabricated "J" to support bunting. Hook Length 1" and Hook Opening 1/2" minimum. 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 masonry veneer joints at locations as shown on the Contract Drawings.
 - 1. McMASTER-CARR Stainless Steel J-Hook Anchors for Wet Concrete.

2.14 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete/masonry substrate.
 - 1. Provide slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 18 inches o.c., unless otherwise shown.
 - 2. Provide mitered and welded units at inside and outside corners.
 - 3. 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.
 - 4. Coordinate attachment of shelf angles thru continuous insulation.
 - 5. 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 or CMU.

2.15 INTERIOR MANHOLE FRAME AND COVER

- A. McKinley Iron Works, PO Box 790, Fort Worth, TX 76106. Frame: BM Heavy Duty. Cover: B26M.
- B. EJ Company (East Jordan Iron Works), Spring Street, East Jordan, MI, Phone: 800-626-4653. #1310 4" Tall Composite Manhole Assembly with Pattern #1310A Solid Cover.

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 ½" diameter, countersunk holes at 12" o.c. (minimum four (4) holes) along both long sides of plate. Centerline of holes 1 ½" 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.

2.18 GALVANIZED STEEL GRATING

- A. Pressure-Locked Galvanized Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
 - 1. Acceptable Manufacturers:
 - a. Amico Grating.
 - b. Indiana Gratings.
 - c. Ohio Gratings, Inc.
 - 2. Bearing Bar Spacing: 11/16 inch o.c.
 - 3. Bearing Bar Depth: Minimum 1-1/2 inches and as required to comply with structural performance requirements.
 - 4. Bearing Bar Thickness: 3/16 inch.
 - 5. Crossbar Spacing: 4 inches o.c.

- 7. Finish: Hot-dip galvanized, coating weight not less than 1.8 oz/sq.ft.
- B. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports. Elevator sump grating covers do not require anchoring.
- C. Fabricate cutouts in grating sections for penetrations. Arrange cut-outs to permit grating removal. Reinforce grating at cutouts if required.
- D. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections and corners for perimeter angle frames. Cut, drill and tap units to receive hardware and similar items.
 - 1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 - 2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 12 inches on center and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 6 inches long.
- E. Separate dissimilar metals.

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

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. Pre-assembled steel stairs with concrete-filled treads.
 - 2. Steel tube railings attached to metal stairs.
 - 3. Steel tube handrails attached to walls adjacent to metal stairs.
 - 4. Wood blocking for anchoring railings.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/sq. ft (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in (2580 sq. mm).
 - 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 (6.4 mm), whichever is less.
- C. Structural Performance of Handrails and Railings: Handrails and railings shall withstand the structural loads required by ASCE 7 without exceeding the allowable design working stress of the materials for handrails, railings anchors and connections. Gravity loads and the following loads and stresses within the limits and under the conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures": Section 9 "Earthquake Loads".
 - 1. Component Importance Factor is 1.50.

1.04 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
 - 1. Refilled metal-pan stair treads.
 - 2. Abrasive nosings.
 - 3. Paint products.
 - 4. Grout.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Provide templates for anchors and bolts specified for installation under other sections.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates. Certified welder employed on the work shall have AWS Certification within 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. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
- E. Special Inspection Requirements:
 - 1. Where materials, welding procedures and qualifications of welders are verified prior to the start of work, periodic inspections of the work in progress and a visual inspection of all welds are made prior to shipping of shop welding, continuous special inspections of welding will not be required.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in the state in which the project is located and who is experienced in providing engineering services of the type indicated and required for this section of the work. Engineering services are defined as those performed for installations of Metal Stairs including handrails and railing systems, that are similar to those indicated for this project in material, design and extent.
- C. Fabricator Qualifications: A firm experienced in producing Metal Stairs similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capability to produce the required units.
- D. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 - 1. Preassembled Stairs: Commercial class.
 - 2. Ornamental Stairs: Architectural class.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- F. 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."

1.07 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 anchorages for metal stairs. 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.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing: ASTM A500/A500M (cold formed).
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

2.03 ABRASIVE NOSINGS

- A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Safety Tread Co., Inc.
 - b. Balco Inc.
 - c. Wooster Products Inc.
 - 1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
 - 2. Nosings: Two-piece units, 3 inches (75 mm) wide, with subchannel for casting into concrete.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.04 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- D. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- E. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 099100 Painting.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, non-gaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Concrete Materials and Properties: Comply with requirements in Section 033000 CAST-IN PLACE CONCRETE for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 4000 psi (20 MPa) unless otherwise indicated.
- E. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.
- F. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.06 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 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. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.07 STEEL-FRAMED STAIRS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alfab, Inc.
 - 2. American Stair, Inc.
 - 3. Sharon Companies Ltd. (The).
- B. Stair Framing:
 - Fabricate stringers of steel plates or channels tubes or a combination of both as indicated.
 a. Provide closures for exposed ends of channel or tube stringers.
 - 2. Construct platforms of steel tube headers and miscellaneous framing members as indicated.
 - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 - 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch (1.7 mm).
 - 1. Steel Sheet: Galvanized and primed cold-rolled steel sheet.
 - 2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
 - 3. Shape metal pans to include nosing integral with riser.
 - 4. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
 - 5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
 - a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.
 - 6. When indicated, provide Hot-Dip galvanized completed fabrications with a factory primer ready for field painting.

2.08 STAIR RAILINGS

- A. Comply with applicable requirements in Section 055213 PIPE AND TUBE RAILINGS or as indicated in this Section.
 - 1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
 - 2. Connect posts to stair framing by direct welding unless otherwise indicated.
- B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 - 1. Rails and Posts: 1-1/2-inch round top and bottom rails and 1-1/2-inch round posts.
 - 2. Picket Infill: Fabricate infill panels from McNichols Design Mesh, TECHNA 3150, Carbon Steel, Cold Rolled, Woven Double Wire Intercrimp Weave, crimped into 1 inch by 1/2 inch by 1/8 inch metal channel frames. Metal channel frame material and finish to match wire mesh. Provide 74% open area mesh. Panels to be spaced less than 3 7/8" clear.
- C. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- D. Form changes in direction of railings as follows:
 - 1. As detailed.
 - 2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- E. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. Connect posts to stair framing by direct welding unless otherwise indicated.
 - 2. For non-galvanized railings, provide non-galvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.09 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Interior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. 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.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Section 033000 CAST-IN PLACE CONCRETE
 - 1. Steel trowel concrete to a smooth finish, free of trowel marks and uniform in texture and appearance. allow concrete to cure for three days. Do not allow traffic on concrete.
 - 2. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.02 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, 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 nonmetallic, nonshrink grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Use type of bracket with predrilled hole for exposed bolt anchorage. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail

and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

- 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
- 2. For hollow masonry anchorage, use toggle bolts.

3.04 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 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. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100 PAINTING

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, but is not limited to, the following:
 - 1. Elevator pit ladder.
 - 2. Interior aluminum roof access ladders.
 - 3. Exterior aluminum roof access ladders.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Section 055000 Metal Fabrications
 - 2. Section 061000 Rough Carpentry
 - 3. Section 077200 Roof Accessories Hatches, Curbs, and Edge Protection
 - 4. Section 142400 Machine Room-Less Traction Passenger Elevator.

1.03 STANDARDS

- A. All work of this section shall conform to ICC/ANSI, industry standards and manufacturer's recommendations.
- B. ASTM B209/B209M "Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate".
- C. ASTM B221 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes".
- D. American Welding Society (AWS) applicable welding methods and standards.
- E. OSHA 29 CFR 1910.27 Fixed Ladders.
- F. FS TT-P-645A "Primer, Paint, Zinc Chromate, Alkyd Type".
- G. NAAMM Metal Finishes Manual.

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Submit pursuant to Section 016100 Product Requirements.
- C. Product Data:
 - 1. Manufacturer's data sheets on each ladder.
 - 2. Manufacturer's product data on the following accessories if specified:
- D. Shop Drawings:
 - 1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrication and their connections.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. Provide reaction loads for each hanger and bracket.
- E. Manufacturer's Qualifications:

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
 - 1. Record of successful in-service performance.
 - 2. Sufficient production capacity to produce required units.
 - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
- C. Product Qualifications: Product design shall comply with OSHA 29 CFR 1910.27 minimum standards for ladders.

1.06 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 care to avoid damage to finished materials.
- 1.07 WARRANTY ALUMINUM LADDERS
 - A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years from date of Substantial Completion against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third-party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.
 - B. Manufacturer shall be notified immediately of defective products and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. O'Keeffe's Inc., 100 N. Hill Drive, Suite 12, Brisbane California 94005, (415) 824-4900 (Basis of Specification).
- B. ALACO Ladder Company, 5167 G Street, Chino, CA 91710, (888) 310-7040.
- C. FIXFAST USA, 6210 S. Indianapolis Rd., Whitestown, IN 46075, (888) 637-7872.
- D. Architect approved equivalent from established ladder manufacturer.

2.02 ROOF ACCESS LADDER (INTERIOR)

- A. Manufacturer: Ladder shall be Model Number SL-132 by Precision Ladders, LLC PO Box 2279 Morristown, TN 37816-2279; T: 800-225-7814 F: 423-586-2091 www.precisionladders.com (Basis of Design); or Approved Equal.
- B. ALUMINUM SHIPS STAIR
 - 1. Aluminum Ships Stair and Components: Stair, mounting brackets and handrails on both sides.
 - a. Model: SL-132 (height in vertical inches) Aluminum Ships Stair as manufactured by Precision Ladders, LLC.
 - b. Capacity: Unit shall support a 1,000 lb (454 kg) total load without failure.
 - c. Degree of Incline: 60 to 70 degrees.
 - d. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.25.
 - 2. Components:
 - a. Stair Stringer: 5 inch by 2 inch by 3/16 inch (127 mm by 51 mm by 5 mm) extruded 6005-T5 aluminum channel.
 - b. Stair Treads: 5-3/16 inch by 1-1/8 inch by 1/8 inch (131 mm by 29 mm by 3 mm) extruded 6005-T5 aluminum with serrated slip resistance surface standard. 1-1/4 inch by 1-1/4 by 1-1/4 inch angle welded to underside of treads. Treads shall be welded and bolted to stringer with 1/4" stainless steel bolts.
 - c. Stair Mounting Brackets:
 - 1) Floor Brackets: 2 inch by 3 inch by 1/4 inch (51 mm by 76 mm by 6 mm) aluminum angle.
 - 2) Top Bracket: 4-3/4 inch by 5 inch by 1/4 inch (121 mm by 127 mm by 6 mm) aluminum angle.
 - d. Handrails: 1-1/4 inches (32 mm) Schedule 40, 6005-T5 aluminum pipe provided with internal aluminum fittings.
 - e. Platform:
 - 1) Surface: Platforms 9 Sq Ft or less shall be made of standard tread material. Platforms larger than 9 Sq Ft shall have a bar grating surface.
 - 2) Toe Boards: 4 inch by 1/4" 6005 T-5 aluminum.
 - 3) Handrails: 1-1/4 inches (32 mm) Schedule 40, 6005-T5 aluminum pipe provided with internal aluminum fittings.
 - f. Finishes:
 - 1) Standard: Mill finish on aluminum stair components.

2.03 PARAPET ACCESS LADDER WITH ROOF OVER RAIL EXTENSIONS (EXTERIOR)

A. Manufacturer: Ladder shall be Model Number 502, as manufactured by O'Keeffe's Inc., 100 N. Hill Drive, Suite 12, Brisbane California 94005, (415) 824-4900

- B. Rungs shall be no less than 1¹/₄" in section and 24" long, formed from tubular aluminum extrusions, alloy 6063-T6, and shall be squared and deeply serrated on all sides to provide maximum grip and foot traction. Rungs shall be able to withstand a 1,000 lb. load without failure. Centerline of rungs shall be as indicated on the drawings from face of wall.
- C. Channel side rails, where specified, shall be no less than .125" wall thickness by 3" wide.
- D. Heaving duty tubular side rails, where specified, shall be assembled from two interlocking aluminum extrusions no less than .125" wall thickness by 3" wide. Construction shall be as follows: self-locking stainless-steel fasteners' full penetration inert-gas heliarc welds; clean, smooth and burr-free surfaces.
- E. Finishes: Mill finish aluminum.
- F. Alternate bottom support required.

2.04 ALUMINUM SHIP LADDER - ACCESS TO ROOF HATCH

- A. Manufacturer: Ladder shall be Model Number 523, as manufactured by O'Keeffe's Inc.,100 N. Hill Drive, Suite 12, Brisbane California 94005, (415) 824-4900.
- B. 75 degree angle.
- C. Ship Ladders: Not less than 1-1/4 inches high, 4-1/8 inch deep and 2 feet wide; tread spacing shall be 1 foot on center. Handrails shall be aluminum pipe, not less than 1-1/2 inches in diameter with hemispheric end caps.
- D. Finish: Mill finish aluminum.

2.05 ELEVATOR PIT LADDER

- A. Provide one elevator pit ladder in each elevator pit. Verify ladder is not included with elevator package.
- B. Ladder shall be of steel construction, prime painted, 18" wide and extend from bottom of pit to 4'-0" above floor level. Rungs shall be spaced 12" o.c.
- C. Securely anchor ladder to floor and wall.
- D. Coordinate ladder location and requirements with approved elevator manufacturer. Make minor adjustments in size of ladder to meet selected elevator supplier's requirements.

2.06 MISCELLANEOUS MATERIALS

- A. 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.
- B. 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-dip galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use expansion bolt devices for drilled-in-place anchors.

C. 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 099100 - Painting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fasteners resistance.
- B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.
- C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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. Steel pipe and tube railings.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials in accordance with ANSI/NAAMM AMP 521 latest edition and based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural anchorage members and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION AND SCHEDULING

- 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 anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

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. Steel Pipe and Tube Railings:
 - a. Wagner, R & B, Inc.; a division of the Wagner Companies.
 - b. Or Architect approved equal.
 - 2. Wire Mesh Infill Panels:
 - a. McNichols Co.
 - b. Or Architect approved equal.

2.02 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.03 STEEL AND IRON

A. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.04 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads. ASTM E894.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593 (ASTM F 738M), and nuts, ASTM F594 (ASTM F 836M).

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 099100 Painting
- E. Intermediate Coats and Topcoats: Provide products that comply with Section(s) 099113 Exterior Painting.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- G. Non-shrink, Non-metallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Anchoring Cement: Factory-packaged, non-shrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.06 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form changes in direction as follows:
 - 1. As detailed.
- J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

- O. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1 inch by 1/2 inch by 1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
- P. Fabricate infill panels from McNichols Designer Mesh, TECHNA 3150, Carbon Steel, Cold Rolled, Woven - Double Wire Intercrimp Weave, crimped into 1 inch by 1/2 inch by 1/8 inch metal channel frames. Metal channel frame material and finish to match wire mesh. Provide 74% open area mesh.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" 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.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.08 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 2. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 3. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 4. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine construction to ensure that aluminum support angles are in place to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening: Use anchorage devices and fasteners for securing railings and for properly transferring loads to adjoining support structure.

3.03 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion / Slip Movement Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.04 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, non-metallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.
- C. Anchor posts to metal surfaces with circular flanges floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.

3.05 ATTACHING RAILINGS

- A. Anchor railing ends at decks with round flanges anchored to deck construction and welded to railing ends.
- B. Anchor railing ends to metal surfaces with flanges through bolted to metal surfaces and flanged Escutcheons welded to railing ends.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.06 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100 Painting

3.07 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

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, but not limited to, the following:
 - 1. Framing with dimension lumber.
 - 2. Wood grounds, nailers, sleepers, furring and blocking.
 - 3. Exterior plywood sheathing/underlayment at roofing system, parapet walls, exterior stud walls and where shown on contract documents.
 - 4. Plywood backing panels.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 061643 _ Gypsum Sheathing.
 - 2. Section 075323 Fully Adhered EPDM Roofing System for wood grounds, nailers, and blocking.
 - 3. Section 077213 Manufactured Curbs for related nailers and blocking.
 - 4. Section 077233 Roof Hatch for related nailers and blocking.
 - 5. Section 084413 Glazed Aluminum Curtain Wall for related nailers and blocking.
 - 6. Section 092116 Gypsum Board Assemblies for related nailers, furring, and blocking.
 - 7. Division 10 Specialties for items requiring blocking.
 - 8. Division 11 Equipment for Items requiring blocking.
 - 9. Division 12 Furnishings for items requiring blocking.
 - 10. Division 23 Heating, Ventilating, and Air Conditioning for rooftop equipment bases and support curbs.

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: American Plywood Association (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).
 - 5. Preservative Treatment: American Wood Preservers' Association (AWPA) U1 Use Category System: User Specification for Treated Wood.
 - 6. Fire-Retardant Treatment: American Wood Preservers' Association (AWPA) Standards.
 - 7. Framing Installation:
 - a. American Forest and Paper Association (AFPA).
 - b. American Institute of Timber Construction (AITC).
- B. ASTM D2898 "Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing".

C. ASTM D5664 - "Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire- Retardant Treated Lumber".

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 direction.
- C. Timber: Lumber of 5 inches or greater in least direction.
- 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.

1.05 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 facility 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 D5664.
 - 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. Fasteners: Provide product data for all fasteners:
 - a. Standard framing lumber and plywood.
 - b. Pressure treated lumber and plywood.
 - c. Fire-retardant treated lumber and plywood.
- B. Material Certificates:
 - 1. For dimensional lumber specified to comply with minimum allowable unit stresses, indicate species and grade to be provided for each different use and design values.
- C. Research/Evaluation Reports: For the following, showing compliance with building codes in effect for Project:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.
 - 4. Powder-actuated fasteners.
 - 5. Expansion anchors,

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. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.
- C. Plywood:
 - 1. Whenever possible, store panels under a roof. Keep sanded panels and appearancegrade products away from high traffic areas to prevent damage to surfaces and edges.
 - 2. Use pieces of lumber to weight down the top panel in a stack to reduce warpage from humidity.
 - 3. If panels must be stored outside, stack them on a **level** platform supported by at least three 4x4s or 6x6s (for standard 4x8 sheets) to keep them off the ground. Locate stacks in a relatively dry area of the site, preferably on a layer of clean crushed stone.
 - 4. Cover the stack(s) loosely with plastic sheets or tarps. Anchor the covering at the top of the stack, but keep it open and away from the sides and bottom to promote good ventilation.
 - 5. Follow all APA Storage and handling recommendations.

PART 2 PRODUCTS

- 2.01 WOOD PRODUCTS GENERAL
 - A. Certified Wood: Lumber and plywood 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".
 - B. Lumber: American Softwood Lumber Standard PS 20 and applicable rules of grading agencies indicated. If no grading agency is specified, 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. 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.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.02 DIMENSION LUMBER AND BOARDS

- A. Qualities: Provide following species, product class, and grade for lumber up to 4 in. thick which is not in contact either with earth or concrete, is not above roof deck, and is not exposed to weather or moist environment. Grade stamp each piece except Appearance grade.
 - 1. Framing, except studs:
 - a. Species: Southern Pine or Douglas Fir Larch.
 - b. Product class: Structural Joists & Planks.
 - c. Stress grade: No. 2.
 - d. Moisture content: 19% maximum. Bring down to 19% after treatment.
 - 2. Studs and plates:
 - a. Species: Southern Pine or Douglas Fir Larch.
 - b. Product class: Light Framing and Studs.

- c. Grade: Stud or Construction.
- d. Moisture content: 19% maximum.
- 3. Blocking and lumber for supporting and fastening of other work, including such items as frames, nailers, curbs, and bases:
 - a. Species: Southern Pine or Western Woods.
 - b. Product class: Structural Joists & Planks or Light Framing.
 - c. Stress grade: No. 2 or Construction.
 - d. Moisture content: 19% maximum. Bring down to 19% after treatment.
 - e. Pressure preservative treatment: see Article 2.04 (Non-treated blocking & furring for cabinets).
 - f. Fire Treatment: All blocking in fire rated walls must be fire-treated wood blocking.
- 4. Furring, grounds, bracing, and other board lumber:
 - a. Species: Southern Pine or Western Woods.
 - b. Product class: Boards.
 - c. Grade: No. 3 or Standard.
 - d. Moisture content: 19% maximum.
 - e. Pressure preservative treatment: see Article 2.04.
- B. Referenced Standards:
 - 1. Lumber: PS 20.
- C. Inspection agencies whose ALSC-certified rules shall be used for lumber in this Work: NeLMA, NH&PMA, NLGA- SPIB, WCLIB, or WWPA.

2.03 PLYWOOD

- A. Qualities: Veneer-face composite or plywood panels, with 15% maximum moisture content, except 18% allowed after re-drying from pressure preservative treatment.
 - 1. Vertical Applications Exposed:
 - a. Thickness: 5/8 in. unless otherwise shown.
 - b. Grade: APA AB, Group 1.
 - c. Exposure durability class: Exposure 1.
 - d. Fasteners: Hot-dip zinc coated galvanized steel, heavy duty (.265" thread diameter) screws or manufacturer's recommendation for application.
 - e. Fastener spacing: 6 in. o.c. at edges; 12 in. o.c. at intermediate supports.
 - 2. Vertical Applications (Not Exposed to View):
 - a. Thickness: 5/8 in. unless otherwise shown.
 - b. Grade: APA CDX, Group 1.
 - c. Exposure durability class: Exposure 1.
 - d. Fasteners: hot-dip galvanized steel, heavy duty (.265 thread diameter) screws or manufacturers recommendation for application.
 - e. Fastener spacing: 6 in. o.c. at edges; 12 in. o.c. at intermediate supports.
 - 3. Horizontal Interior Locations Exposed
 - a. Thickness: 23/32"
 - b. Grade: APA BC Exterior Grade, Class 1.
 - c. Fasteners: hot-dip galvanized steel, heavy duty (.265 thread diameter) screws or manufacturers recommendation for application.
 - d. Fastener spacing: 6 in. o.c. at edges; 12 in. o.c. at each intermediate support.
 - 4. Roof Applications:
 - a. Thickness: 3/4 in., 7-ply fire-retardant unless otherwise shown.
 - b. Grade: APA CDX, Group 1.
 - c. Exposure durability class: Exposure 1.
 - d. Fasteners: Hot-dip zinc coated galvanized steel (ASTM A153-Class C) or stainless-steel (Type 316) #8 countersunk screw long enough to penetrate bottom

flute of metal decking by 3/4". Screw pull out strength in metal deck must be 500 lbs. or greater.

- e. Fastener spacing: 8 in. o.c. at 4-foot edge; 24" o.c. at perpendicular edges and 12" o.c. in the field. Minimum 29 fasteners per 4' x 8' sheet.
- f. H-clips: As required or shown on the Drawings.
- g. Plywood must meet or exceed span and load requirements.
 - 1) 40 lb. snow load minimum or greater if indicated on Structural Drawings Design Load Tables.
 - 2) 24" o.c. span unless otherwise indicated on the Drawings.
- B. Exterior Wall Sheathing:
 - 1. Thickness: 3/4 in. unless otherwise shown.
 - 2. Grade: APA CDX, Group 1.
 - 3. Exposure durability class: Exposure 1.
 - 4. Fasteners: Hot-dip zinc coated galvanized steel (ASTM A153-Class C) or stainless-steel (Type 316) #8 countersunk flat head screw.
 - 5. Fastener spacing: 8 in. o.c. vertically at each stud, 8 in. o.c. horizontally at top and bottom track, door headers, window and louver headers, and sills.
- C. Plywood Equipment Mounting Panels; Telephone, IT and Electrical Equipment Backing Panels
 - 1. 3/4" minimum nominal thickness using glues without urea formaldehyde.
 - 2. Plies: Minimum 5.
 - 3. Grade: APA DOC PS 1, C-D PLUGGED, Exposure 1.
 - 4. Fire retardant treated.

2.04 PRESERVATIVE TREATMENT

- A. Treat lumber and plywood where indicated and as specified. Comply with applicable AWPA Standards and quality control and inspection requirements.
 - 1. Fasteners and anchoring devices to be used with wood treated with waterborne preservatives shall be hot-dip galvanized or stainless steel.
- B. Complete fabrication to the greatest extent possible prior to treatment of items to be treated. Where items must be cut after treatment, coat cut surfaces with heavy brush coat of the same chemical used for treatment or other solution recommended by AWPA Standards for the treatment.
- C. Inspect wood after treating and drying. Discard warped or twisted items.
- D. Pressure Treatment: Treat wood items with waterborne preservatives, complying with AWPA Standard U1: Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent after treatment and plywood to 18 percent after treatment.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic, chromium or chromated copper arsenate (CCA).
- E. Mark each piece of plywood and lumber with treatment quality mark of an inspection agency approved by the American Lumber Standard Committee (ALSC) Board of Review.
- F. Application: Treat miscellaneous carpentry, including but not limited to the following:
 - 1. Nailers, blocking, cants, shim stock, and similar members used in conjunction with roofing (including related flashings, trim and vapor barrier), coping, and waterproofing.
 - 2. Nailers, blocking, furring, stripping, and similar concealed members in contact with exterior masonry and concrete (including interior width of exterior walls), and all sills for framing.
 - 3. Wood items indicated or shown on the Contract Drawings to be preservative treated.

- G. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Georgia Pacific.
 - 2. Hoover Treated Wood Products, Inc.
 - 3. Koppers Performance Chemicals.
 - 4. Viance Treated Wood Solutions.

2.05 FIRE RETARDANT TREATMENT

- A. Furnish "FR-S" lumber where indicated, complying with AWPA Standards for pressure impregnation with fire-retardant chemicals to achieve a flame spread rating of 25 or less, when tested in accordance with UL 723, ASTM E94 or NFPA 255.
 - 1. Where treated items are indicated to receive a transparent or paint finish, use a fire-retardant treatment which will not bleed through or adversely affect bond of finish.
 - 2. In exterior applications or applications of exterior sheathing and blocking other than roof sheathing use FRX fire retardant lumber.
 - 3. Provide UL label or identifying mark on each piece of fire-retardant lumber.
 - 4. Redry treated items to maximum moisture content of 19% for lumber and 15% for plywood.
- B. Fire Retardant Wood and Plywood Roof Sheathing
 - 1. Manufacturer:
 - a. Arch Wood Protection, Inc., Dricon®, 3941 Bonsal Road, Conley, GA 30288; Telephone: (404) 362-3970. (Basis of Specification)
 - b. Viance Treated Wood Solutions, D-Blaze® FRTW, 8001 IBM Drive, Building 403, Charlotte, NC 28262; Telephone: (800) 421-8661.
 - c. FLAMEPRO®, Koppers Performance Chemicals, 1016 Everee Inn Road, Griffin, GA 30224; Telephone: 770-233-4200.
 - d. ProWood® FR, a brand of UFP Retail Solutions, 2801 East Beltline NE, Grand Rapids, MI 49525. Phone: (800) 598-9663.
 - 2. Product Treatment: Dricon FRT is produced by licensed treatment plants. Fire Retardant chemical shall provide protection against termites and fungal decay, shall be registered for use as a wood preservative by the U.S. Environmental Protection Agency (EPA), shall comply with formulation FR-1 of the current edition of AWPA Standard P17, and shall be free of halogens, sulfates and ammonium phosphate. Treated wood shall have a flame spread of less than 25 when tested in an extended 30-minute tunnel test in accordance with ASTM E84, NFPA 255 or UL 723.
 - a. Provide Fire Retardant pressure treated lumber and plywood that meets UL FRS classification when tested in accordance with IBC section 2303.2.
 - Testing: Testing on fire performance, strength, and corrosion properties of fire retardant treated wood shall be recognized by issuance of a National Evaluation Services Report.
 - b. Corrosion Properties: Fire retardant treated wood in contact with carbon steel, galvanized steel, aluminum, copper and red brass shall exhibit corrosion rates less than 1 mil (0.025 mm) per year when tested in accordance with Fed. Spec. MIL-L-19140, Paragraph 4.6.5.2.
 - 3. Fire Retardant Treatment:
 - a. Manufacturer's solution for fire retardant treatment of wood meets AWPA T1 and AWPA P50 formulation standards.
 - b. Plywood Treatment Standard: wood treatment process complies with AWPA Standard C27, current edition, and Appendix H of AWPA Use Category System.
 - 4. Warranty
 - a. Warranty Period: Minimum 40-year roof warranty against heat degradation commencing on Date of Substantial Completion.

2.06 FRAMING HARDWARE

- A. Fasteners and Anchoring Devices: Select and furnish items of type, size, style, grade, and class as required for secure installation of the Work. Items shall be hot-dip zinc coated galvanized steel (ASTM A153/A153M-Class C) or stainless-steel (Type 316) for exterior use. Unless shown or specified otherwise, comply with the following:
 - 1. Nails and Staples: FS FF-N-105.
 - 2. Wood Screws: FS FF-S-111.
 - 3. Bolts and Studs: FS FF-B-575.
 - 4. Nuts: FS FF-N-836.
 - 5. Washers: FS FF-W-92.
 - 6. Lag Bolts or Lag Screws: FS FF-B-561.
 - 7. Masonry Anchoring Devices: Expansion shields, masonry nails and drive screws: FS FF-S-325.
 - 8. Toggle Bolts: FS FF-B-588.
 - 9. Bar or Strap Anchors: ASTM A575 carbon steel bars.
 - 10. Wall Plugs: Corrugated type, galvanized steel, 24 USS gage min, not less than 2 inches wide x 2-1/2 inches deep.
 - 11. Cross Bridging: Nailable type, galvanized steel, 16 USS gage min, by 3/4 inch wide.
 - 12. Metal Hangers and Framing Anchors: Size and type for intended use, galvanized finish, manufacturer's recommended fasteners.
 - 13. Buck Anchors: Corrugated type, galvanized steel not lighter than 12 USS gage min, 4 inches wide (except where partitions are less than 4 inches thick) by 8 inches long, punched for two 5/16-inch carriage bolts at buck end.
 - 14. Sleeper Anchors: Approved type, galvanized steel not lighter than 20 USS gage min, not less than 1-1/4 inches wide, designed to anchor into concrete not less than 1-1/2 inches and permit height adjustment of sleeper.

PART 3 EXECUTION

3.01 FRAMING

- A. Frame the Work according to NFPA Manual for Wood Frame Construction.
- B. Cut pieces for full wood-to-wood fit at connections. Do not splice freestanding members.
- C. Examine each piece of lumber before setting in place. Set the soundest pieces in positions of greatest stress. Select clearest pieces for exposed use. Discard pieces which have defects that impair their structural function.
- D. Set members plumb, level, or to slope shown.
- E. Do not cope or notch horizontal members more than 1/6 their depth in center third of span, nor more than ¼ joist depth at end thirds. Drill joists for passage of lines in end thirds only. Drilled holes shall be no more than 1/3 joist depth and shall leave a full 2 in. of wood top or bottom.

3.02 FASTENERS AND FASTENER SPACING

- A. For work above roof, all other exterior locations or in damp locations, use hot-dip zinc coated galvanized steel (ASTM A153/A153M-Class C) or stainless steel (Type 316) common nails, screws, bolts, nuts and washers.
- B. Drive nails or screws full depth, drilling hard or brittle woods first to prevent splitting. Leave no hammer marks in exposed work. In beams, headers and trimmers built up from 2x lumber, nail 16 in. o.c. minimum, staggered top and bottom.

- C. Nail/Screw according to NFPA Manual for Wood Frame Construction Table 11, except as more stringently specified herein or shown on Contract Drawings.
- D. For exposed work, arrange fasteners in straight rows parallel with edge members, with fasteners evenly spaced, and with adjacent rows staggered.

3.03 WALL AND PARTITION FRAMING

- A. General: Provide single bottom plate at interior walls, double bottom plates at all exterior walls and double top plates at all walls using members of 2-inch nominal thickness whose widths equal that of studs. Top and bottom plates to also match studs in species and/or construction. Fasten plates to supporting studs unless otherwise indicated.
 - 1. For exterior walls: See Contract Drawings for size and spacing.
 - 2. For interior partitions and walls, provide 2-x-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 studs. Support headers on jamb studs.
 - 1. 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 than 10-inch nominal depth for openings 10 to 12 feet in width unless larger member sizes are indicated on the Contract Drawings.
 - 2. 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 on Contract Drawings.

3.04 CEILING FRAMING

- A. Provide ceiling framing members of sizes and spacing as shown, with double headers and trimmers. Set on double plates at stud walls.
- B. Connect and bridge ceiling framing with steel bridging installed to comply with bridging manufacturer's written instructions.
- C. Provide special framing as indicated for eaves,

3.05 BLOCKING AND OTHER SUPPORT MEMBERS

- A. Select sound lumber for blocking, nailers, sleepers, cants, deck edges, curbs, frames, bases, and ledgers. Use fire retardant treated and pressure treated products where specified and/or shown on Contract Drawings. Blocking in fire rated walls must be fire-treated wood blocking.
- B. Provide quality and size of fasteners that will support live and dead loads. Recess bolts and nuts flush with surfaces as necessary to avoid conflict with roofing and other adjoining or covering work. Provide washers where bolt heads and nuts bear against wood.
- C. Furnish and install wood framing as shown on Contract Drawings at exterior framed openings.
- D. Furnish and install exterior blocking and ledgers for support of all exterior construction, including but not limited to roof top equipment, parapets, snow guards, decorative moldings, building mounted light fixtures, building mounted signage, fascia, rake, and soffit framing.
- E. Furnish and install interior blocking and ledgers for support of all wall-hung construction including, but not limited to fixtures, cabinets, countertops, recessed equipment, shelving,

railings, toilet partitions, shower rods, towel hooks, shower seats, lockers, door wall bumpers, coat racks, light fixtures, drinking fountains, and mirror brackets.

- F. Furnish and install blocking in all drywall ceilings and soffits for support of all ceiling hung construction including, but not limited to, light fixtures, air drops, cord reels, speakers and projector screens.
- 3.06 EXTENT AND INSTALLATION OF PRESERVATIVE TREATED WOOD
 - A. Provide PPT lumber at locations indicated on Contract Drawings.
 - B. Install PPT lumber with galvanized steel or stainless-steel fasteners and connectors that do not react with the particular treatment salt that has been used.
 - C. Apply a heavily brushed touchup coat to cuts, holes, and abraded or dented areas of each piece of treated lumber using specified chemical.
- 3.07 FIRE RETARDANT PLYWOOD ROOF SHEATHING; PARAPET CAPS AND/OR EXTERIOR PLYWOOD SHEATHING
 - A. Store and install in accordance with manufacturer's recommendations.
 - B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
 - C. Provide 1/8" spacing between adjacent sheets of plywood.
- 3.08 EXTERIOR WOOD PROTECTION
 - A. Installed exterior plywood, wood blocking and any other exterior wood products must be covered with either permanent or temporary coverings at the end of each day's work.

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 the following:
 - 1. Gypsum sheathing in exterior cavity wall construction.
 - 2. Gypsum sheathing at roof side of parapets.
 - 3. Sheathing in areas of vertical membrane roofing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 054000 Cold Formed Metal Framing
 - 2. Section 061000 Rough Carpentry

1.03 REFERENCES

- A. ASTM C1177/C1177M Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- B. ASTM C1280 Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.
- C. ASTM C1396/C1396M Standard Specification for Gypsum Board; 2017.
- D. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- E. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.
- F. GA-216 Application and Finishing of Gypsum Panel Products; 2021.
- G. GA-600 Fire Resistance and Sound Control Design Manual; 2021.
- H. GA-253 "Recommended Specifications for the Application of Gypsum Sheathing".

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016100 Product Requirements.
- C. Product Data:
 - 1. Submit manufacturer's product data for each type of exterior gypsum sheathing indicating where each type will be used.
 - 2. Submit fastener data as recommended by exterior gypsum sheathing manufacturer and as specified herein.
- D. Warranty:
 - 1. Submit sample warranties for all warranty requirements specified in he Warranty paragraph below.

- 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. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- D. Fire-Test-Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
 - 1. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements.
- C. Neatly stack gypsum panels flat to prevent sagging.
- 1.07 WARRANTY
 - A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).
 - B. Manufacturer's Warranty:
 - 1. Five (5) years against manufacturing defects.

PART 2 PRODUCTS

- 2.01 MATERIALS
 - A. Gypsum Sheathing Cavity Wall
 - Glass-Mat Gypsum Board: Gypsum board designed as an exterior substrate for a weather barrier, consisting of a noncombustible water-resistant core, essentially gypsum, surfaced with glass mats on face and back, partially or completely embedded in core, and with unsurfaced square edges. Comply with ASTM C1177/C1177M and requirements below.
 a. Type: X
 - b. Thickness: 5/8 inch
 - 2. Products: Subject to compliance with requirements, gypsum sheathing boards that may be incorporated in the Work include, but are not limited to, the following:
 - a. Dens-Glass® Gold Exterior Sheathing; Georgia-Pacific Gypsum LLC
 - b. GlasRoc® Sheathing; CertainTeed
 - c. Fiberock® Aqua-Tough Sheathing; U.S. Gypsum Company

- 3. Sheathing fasteners: ASTM C954, steel drill screws, Type S-12 fluted tip, a minimum of 1-¼ inches long with organic polymer coating or other corrosion-protective coating.
- B. Gypsum Sheathing to receive roofing material:
 - 1. On the roof side of framed parapets and other vertically framed areas where sheathing will be covered by roofing materials use fiberglass-mat faced gypsum roof board.
 - a. Thickness: 5/8 inch
 - b. Weight: 2.55 psf.
 - c. Surfacing: Fiberglass mat with non-asphaltic coating.
 - d. Flexural Strength, Parallel (ASTM C 473): 100 lbf, minimum
 - e. Flute Span (ASTM E 661) 8 INCHES.
 - f. Permeance (ASTM E 96): Not more than 32 perms
 - g. R-Value (ASTM C 518): Not less than 0.67
 - h. Water absorption (ASTM C 1177): Less than 10 percent of weight.
 - i. Compressive Strength (Applicable Sections of ASTM C 472): 500 to 900 pounds per square inch.
 - j. Surface Water Absorption (ASTM C 473): Not more than 2 grams.
 - k. Acceptable products:
 - 1) DensDeck Prime, Georgia-Pacific Gypsum.
 - 2) Architect approved equivalent
 - 2. Sheathing fasteners: ASTM C 954, steel drill screws, Type S-12 fluted tip, a minimum of 1-¼ inches long with organic polymer coating or other corrosion-protective coating.

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.
 - B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
 - C. Coordinate wall 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.
 - D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.02 SHEATHING INSTALLATION

- A. Comply with ASTM C1280, GA-253 and manufacturer's written instructions. Erect gypsum sheathing pursuant to GA-216 and fasten at 6" o.c. along panel edge locations and 12" o.c. field locations with 1 ¼" S #6 screws.
 - 1. Fasten sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch gap where non-load bearing construction abuts structural elements.
 - 3. Install boards with a ¼ inch 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 boards but do not cut into facing.

- C. Horizontal Installation: 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 stud.
 - 1. Space fasteners approximately 6 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 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 6 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 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. Do not bridge building expansion joints; cut and space edges of gypsum sheathing to match spacing of structural support elements.

3.03 PROTECTION

- A. Protect gypsum sheathing and gypsum roof board until covered.
- B. Replace broken or damaged sheathing.
- C. Apply permanent or temporary covering within manufacturer's stated exposure limits.

END OF SECTION

H2M

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. Closet shelving and rods.
 - 3. Wood window sills.
 - 4. Replaceable Training Opening Wood Sills.
- 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 064000 Architectural Woodwork for simulated wood trim, moldings, columns, and ornamentation.
 - 3. Section 064113 Wood Veneer Faced Architectural Cabinets.
 - 4. Section 081429 Pre-finished Wood Doors for wood doors.
 - 5. Section 083313 Overhead Coiling Wood Counter Door for coiling wood doors.
 - 6. Section 092116 Gypsum Board Assemblies for Related Nailers, Furring, and Blocking.
 - 7. Section 099100 Painting for back priming and finishing of finish carpentry, interior and exterior wood items.
 - 8. Section 123200 Manufactured Wood Casework.

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 016000 Product Requirements.
 - C. Product Data:
 - 1. Provide where available product data and/or profile sheets of specified wood products.
 - D. 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.
- E. Shop Drawings:
 - 1. Provide shop drawings for the following:
 - a. Wood Window Sills
 - b. Replaceable Training Opening Wood Sills

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, mouldings 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 has been operating for ten days and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.01 MOLDING AND TRIM MANUFACTURERS

- A. Baird Brothers Fine Hardwoods, 7060 Crory Road, Canfield, OH 44406. Phone: 800-732-1697. (Basis of Specification where applicable).
- B. Cherokee Wood Products, 1390 East Arrow Highway, Upland, CA 91786. Phone: 909-920-5430.
- C. Cortland Hardwood Products, 124 Pearl Street, Cortland, Ohio 44410. Phone: 330-638-3232.

D. Erich's Fine Woodworking, Inc., 46 Violet Ave., Poughkeepsie, NY 12601. Phone: 845-229-1201.

2.02 WOOD WINDOW SILLS

- A. Furnish and install oak window sills at all locations shown on the Contract 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)
 - 4. Oak Color: White.

2.03 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. Refer to Section 102813 Toilet and Miscellaneous Accessories for closet rod.

2.04 REMOVEABLE TRAINING OPENING WOOD SILL

- A. Furnish and install oak window sills at all mezzanine training openings.
 - 1. Thickness: Minimum 1-1/2".
 - 2. Sills greater in depth than 8" shall be kerf cut.
 - 3. Provide 1/2" radius edge on both sides of sill.
 - 4. All sills shall be stained with color as selected by the Architect and finished with three (3) coats of polyurethane.
 - 5. Quality: Clear (3% maximum moisture content).
 - 6. Oak Color: White or Red.
- B. Mounting Hardware:
 - 1. Four (4) 5/8" diameter, stainless steel bolts per sill.
 - 2. Four (4) 5/8" stainless steel, ferrule threaded inserts from one of the following manufacturers:
 - a. Dayton Superior F-42 loop ferrule insert.
 - b. Meadow Burke FX-5 ferrule insert loop.
 - c. ALP Supply FI-42 flared loop ferrule.

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. Do not install finish carpentry items until permanent, building HVAC system has been operating for a minimum of ten (10) days.

- C. 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.
- D. 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. At window openings wood wainscot shall terminate flush with the GWB return and top rail mitered at termination to return to wall.
 - 5. No unfinished edges or end are allowed in Finish Carpentry or Finish Carpentry systems.
 - 6. All wood joints shall be mitered.
 - 7. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.
- C. Training Opening Sills.
 - 1. Install each hardwood sill at training opening with four (4) 5/8" stainless steel, recessed bolts with stainless steel lock washers. provide four (4) stainless steel ferrule loop inserts (NC thread) embedded in fully grouted CMU cells. Space inserts equally across opening but centered in CMU cell. Protect insert threads during grouting operation.

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 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave ¼ gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
 - 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners as recommended by panel manufacturer.
 - 2. Conceal fasteners to greatest practical extent.
 - 3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with pre-finished heads matching groove or panel color.
 - 4. At vertical joints in wainscot paneling, paint a one-inch wide strip on the GWB substrate to match the paneling.

3.06 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.

3.07 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. 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. Section Includes:
 - 1. Architectural custom wood cabinets and custom casework.
 - 2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
 - 3. Cabinet Hardware.
 - 4. Preparation for installing utilities.
 - 5. Shop finishing of architectural wood cabinets and custom casework.
- B. Related Requirements:
 - 1. Section 061000 Rough Carpentry for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
 - 2. Section 123661 Quartz Surfacing Countertops and Windowsills.

1.03 REFERENCES AND STANDARDS

- A. Architectural Woodwork Institute (AWI) www.awinet.org.
- B. Woodwork Institute (WI) www.woodworkinstitute.com.
- C. North American Architectural Woodwork Standards (NAAWS) Manual.

1.04 PREINSTALLATION MEETINGS

- A. Before starting installation of architectural cabinetry and casework, General Contractor shall hold a job-site meeting to discuss and coordinate the proper installation of materials.
 - 1. Require attendance with all parties directly related to cabinetry, casework, and countertop/work surface installation.
 - 2. Notify Architect, Owner's Representative, Casework Installer, Countertop Installer, Plumbing Contractor, Electrical Contractor and other contractors as necessary well in advance of meeting. Meeting shall occur immediately following a regularly scheduled project, progress meeting.
 - a. If ANSUL System is to be located in wall cabinetry, include appropriate parties.

1.05 ACTION SUBMITTALS

- A. Submit Pursuant to 013300 Submittal Procedures.
- B. Submit Pursuant to 016000 Product Requirements.
- C. Product Data: For each type of product, including panel products, cabinet hardware, accessories, and finishing materials and processes.
- D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.

- 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- 3. Show locations and sizes of cutouts and holes for plumbing penetrations, electrical switches, outlets, and other items installed in cabinets and casework.
 - a. The kitchen range hood fire suppression system (ANSUL System) is to be located in an adjacent wall cabinet. Coordinate with ANSUL System contractor for placement of the system within the wall cabinet.
- 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the fitch and sequence within the fitch for each leaf.
- 5. Apply AWI Quality Certification Program label to Shop Drawings.
- E. Samples for Initial Selection:
 - 1. Submit three (3) samples of each available shop-applied transparent finish available for selection by the Architect. If a specific color has been specified in the Contract Documents, this submission may be eliminated.
- F. Samples for Verification:
 - 1. Lumber for transparent finish, not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.
 - 2. Veneer leaves representative of and selected from flitches to be used for transparent-finished cabinets.
 - 3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
 - b. Miter joints for standing trim.
 - 4. Exposed cabinet hardware and accessories, one unit for each type and finish if requested by Architect.

1.06 INFORMATIONAL SUBMITTALS

- A. Submit Fabricator/Installer Qualifications as outlined in Quality Assurance.
- B. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.07 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: A Certified Participant in WI's Certified Compliance Program.
- C. 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.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas,

store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.09 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and permanent HVAC system has been operating and maintaining temperature between 60 and 80 deg F and relative humidity between 25 and 50 percent for a minimum ten (10) days. Building HVAC must maintain temperature and humidity at above levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.
- B. Hardware Coordination: Hardware is to match Wood Mode Standard Aluminum Finish Hardware; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 PRODUCTS

2.01 ARCHITECTURAL CABINET FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets and casework with sequence-matched wood veneers and wood trim.

2.02 ARCHITECTURAL WOOD CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.03 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Type of Construction: Frameless.
- C. Cabinet and Door and Drawer Front Interface Style: Full overlay.

- D. Reveal Dimension: As indicated.
- E. Wood for Exposed Surfaces:
 - 1. Species: HPVAHP-1 Grade A, White Oak.
 - 2. Cut: Plain sliced/plain sawn.
 - 3. Grain Direction: Vertically for doors and fixed panels, and drawer fronts.
 - 4. Matching of Veneer Leaves: Book match.
 - 5. Veneer Matching within Panel Face: Center-balance match.
 - 6. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single fitch with doors, drawer fronts and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
- F. Semi exposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 - 2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, same species indicated for exposed surfaces.
 - 3. Drawer Bottoms: Hardwood plywood.
- G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued dovetail joints.
- H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under countertops or work surfaces.

2.04 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.
 - 2. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - 2. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.05 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 110 degrees of opening, self-closing and soft close.
 - 1. Manufacturers:
 - a. Grass America Inc: www.grassusa.com.
- B. Drawer and Door Pulls: Zinc Construction.
 - 1. Product: Cityscape, manufactured by Amerock or approved equal.
 - a. Drawer Pull Size: 3-3/4 inch center-to-center.
 - b. Door Pull Size: 3-3/4 inch center-to-center.
 - c. Finish: Oil-rubbed bronze.
- C. Catches: Magnetic catches, BHMA A156.9, B03141.

- D. Adjustable Shelf Standards and Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments. BHMA A156.9, B04071; with shelf rests, B04081.
- E. Shelf Rests: BHMA A156.9, B04013; metal.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1HD-100: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 2. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
 - 3. Features: Provide self closing/stay closed type.
 - 4. Manufacturers:
 - a. Accuride International, Inc: www.accuride.com.
 - b. Grass America Inc: www.grassusa.com.
 - c. Knape & Vogt Manufacturing Company: www.knapeandvogt.com.
- G. Door and Drawer Locks: Furnish cam type locks on all doors and drawers indicated to have locks on Contract Drawings. Furnish two (2) keys per lock and four (4) master keys.
 - 1. Basis of Design: CompX National: Cam Lock.
 - 2. Type: Pin tumbler cylinder cam lock, brass construction, with chrome finish complying with BHMA A156.11.
- H. Door and Drawer Silencers: BHMA A156.16, L03011.
 - 1. Provide on all cabinet/casework doors and drawers.

2.06 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives General: Do not use adhesives that contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D, (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Contact Adhesives: 250 g/L.
- E. Wood Putty: Pigmented, oil-based putty formulated specifically for use on wood.
 - 1. Color: Blend different colors colors of putty as required to match cabinet wood color(s).

2.07 FABRICATION

- A. Provide filler panels where required for the proper operation of cabinet doors (minimum 90 degree opening) near adjacent walls.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for

shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

- 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
- 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.08 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Finish Materials: Use finish materials that meet 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."
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
- D. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish System 5, conversion varnish.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: Custom to match Architect's sample.
 - 5. Sheen: Satin, 31 45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 EXECUTION

3.01 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.02 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - 1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish or toggle bolts through metal backing or metal framing behind wall finish.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
 - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.
- H. Refer to for final finishing of installed architectural woodwork.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

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. Plastic-laminate-faced architectural cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products high-pressure decorative laminate adhesive for bonding plastic laminate.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
 - 4. Apply AWI Quality Certification Program label to Shop Drawings.
- C. Samples for Initial Selection:
 - 1. Plastic laminates.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator.
- B. Product Certificates: For each type of product.
 - 1. Composite wood and agrifiber products.
 - 2. High-pressure decorative laminate (HPL).
 - 3. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: AWI (AWS) Quality Certification Program certificates.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI (AWS)'s Quality Certification Program.
- B. Installer Qualifications: Fabricator of products.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Premium
- C. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Atlantic Millwork, 370 Sackett Point Road, North Haven, CT, 06473 (203) 248-1969.
 - 2. Artisan Custom Interiors, LLC, South Plainfield, NJ, 07080, (201) 303-7770

- 3. Tobin Woodworking, Inc., 155-B Allen Boulevard, Farmingdale, N.Y. 11735 (631) 249-1614.
- 4. MTD Corporation, 41 Otis Street, W. Babylon, N.Y. 11704 (631) 491.3905 www.mtdwoodwork.com.
- 5. M & D Millwork, LLC, 178 New Highway, Amityville, N.Y. 11701 (631) 608.4444 www.mdmillwork.com.
- 6. North Shore Custom Woodworking, 16 Clifford Place, East Norwich, N.Y. 11732 (516) 946.9166 www.northshorecustomwoodworking.com.
- 7. Lifetime Design Group, 162 E. Industry Court, Deer Park, N.Y. 11729 (631) 242.1162 www.lifetimedesigncorp.com.
- 8. Handcraft Cabinetry Inc., 230 Ferris Avenue, White Plains, N.Y. 10603 (914) 681-9437 mike@handcraftcabinetry.com.
- D. Type of Construction: Flush Overlay
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 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. Formica Corporation
 - b. Wilsonart International; Div. of Premark International, Inc.
 - c. Or approved equal.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGL.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS.
 - 4. Pattern Direction: As indicated.
- G. Materials for Semi-exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Wood grains, matte finish.
 - b. Patterns, matte finish.

2.02 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.

- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Softwood Plywood: DOC PS 1.
- C. Plywood Panel Material for Curved and Radial type millwork and cabinetry: Bendable Plywood (Curve-Ply, Flexply, Wacky Wood and Wiggle Wood) constructed from Meranti hardwood veneers with all layers running in one direction to enable bending to achieve curving and radial configurations. Material manufactured in the United States and distributed by Packard Forest Products (877) 200-4213 or Architect approved equivalent.A
 - 1. Thicknesses: 9mm.
 - 2. Panel Sizes: 120 inches by 48 inches (Grain in 48 inch direction).
 - 3. Veneer: Plastic Laminate as selected by the Architect..
 - 4. Finish: Covered in Plastic Laminate in Texture, Color and Pattern as selected by the Architect.

2.03 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware" and as indicated on the drawings.

2.04 MISCELLANEOUS MATERIALS

- A. Adhesives: Do not use adhesives that contain urea formaldehyde.
- B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.05 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.02 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Engineered, tested, thermally-broken, aluminum rainscreen and/or cladding support systems framing assembly at exterior facade.
- 1.02 RELATED SPECIFICATION SECTIONS:
 - A. Section 07 21 13 Mineral Board Insulation
 - B. Section 07 27 26 Fluid-Applied Membrane Air Barriers
 - C. Section 07 46 46.11 High-Density Fiber Cement Wall Panels
 - D. Section 07 46 16 Metal Cladding
 - E. Section 07 62 00 Sheet Metal Flashing and Trim
 - F. Section 07 92 00 Joint Sealants
 - G. Section 08 11 13 Hollow Metal Doors and Frames
 - H. Section 08 41 13 Aluminum-Framed Entrances and Storefronts
 - I. Section 08 44 13 Glazed Aluminum Curtain Walls
 - J. Section 08 80 00 Glazing
 - K. Section 08 90 00 Louvers

1.03 REFERENCES

- A. AAMA 501.1 Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2017.
- B. AAMA 509 Voluntary Test and Classification Method for Drained and Back Ventilated Rainscreen Wall Cladding Systems; 2022.
- C. AAMA 508 Voluntary Test Method and Specification for Pressure Equalized Rainscreen Wall Cladding Systems; 2021.
- D. AISI S100 North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- E. AISI S200 North American Standard for Cold-Formed Steel Framing General Provisions; 2012.
- F. AISI S211-North American Standard for Cold-Formed Steel Framing-
- G. AISI S212-North American Standard for Cold-Formed Steel Framing -
- H. AISI S213- North American Standard for Cold-Formed Steel Framing -
- I. ASTM C1363 Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2019.

- J. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- K. 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).
- L. ICC-ES AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- M. ICC-ES AC308 Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
- N. ASTM E1233- Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential
- O. ASTM C1513 -Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- P. ICC ES AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements
- Q. ICC ES AC261 -Acceptance Criteria for Connectors used with Cold-Formed Steel Structural Members
- R. ICC ES AC308 Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- 1.04 ADMINISTRATIVE REQUIREMENTS
 - A. Pre-installation Meeting: Pre-installation Meeting: Arrange in conformance to requirements of Division 01
 - 1. Attendance: Contractor, installer, Owner, Architect, manufacturer's engineer providing curtain wall systems design, manufacturer's technical representative, and those representing related work requested to attend.
 - 2. Meeting Time: Minimum 2 weeks prior to prior to beginning work of this Section and work of related Sections affecting work of this Section.
 - 3. Location: Project Site.
 - B. Sequencing and Scheduling: Conform to Construction Progress Schedule for Critical Path and scheduling for long lead items and to avoid delaying work.

1.05 SUBMITTALS

- A. Product Data:
 - 1. Descriptive product literature describing assembly design, performance, and characteristics include each profile, size, and type of component and fastener.
 - 2. Include documentation or Engineering Evaluation confirming assembly meets the acceptance criteria of NFPA 285.
- B. Shop Drawings: Include project-specific plans, elevations, and details.
 - 1. Include anchorage and attachment details coordinated with each type of rainscreen cladding, showing bracket and rail layout, connection details, fastener types and spacing, and accessories.
 - 2. Interface of aluminum assembly with adjacent construction.
 - 3. Stamped and signed by licensed professional engineer, registered with the New York.

- C. Samples: Two each of components and fasteners for system assembly.
- D. Design Calculations:
 - 1. Comprehensive analysis of design loads, including dead loads, live loads, wind loads, and thermal movement.
 - Design shall be sealed by a Professional Engineer licensed in the New York.
].
 - 3. Test Data: Independent test results or engineered analysis for performance signed by independent agency representative.
- E. Manufacturer's Instructions: Include installation instructions, clearances, special procedures, and conditions requiring special attention.
- F. Good Standing: Written and signed by manufacturer's agent indicating installer as in good standing and approved to erect work of this Section.
- G. Sample Warranty: Meet or exceed provisions specified by this Section.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Able to document minimum 3 years of experience designing and supplying work of this Section.
 - 2. Maintain locally available technical product representation available to meet at project site as needed for meetings and inspections of work.
- B. Installer Qualifications:
 - 1. Trained and authorized by manufacturer as qualified to install work of this Section.
 - 2. Employ full-time on-site superintendent or foreman to overseeing installation during work of this Section.
 - 3. Able to show successfully completed projects of equivalent scope and quality upon request by Architect.
- C. Mock-Ups: Provide under Quality Assurance provisions of Division 01.
 - 1. Mock up complete system at location as directed by Architect.
 - 2. Provide as required to illustrate substrate, air barrier, insulation, framing, flashing, thermal isolation, and treatments at fenestration, corners, and transitions.
 - 3. Verify mock-up as conforming to manufacturer's instructions and provisions of Contract Documents.
 - 4. Do not begin work of this Section until after inspection by manufacturer's representative is complete and mock-up has been accepted in writing by Architect.
 - 5. Protect and maintain accepted mock-up as standard of quality for work of this Section.
 - 6. Accepted mock-ups may be incorporated into the work of this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Conform to provisions of Division 01 and manufacturer's instructions.
- B. Ordering: Conform to manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Store and handle to keep clean, dry, and protected from damage due to weather and construction activities.

1.08 FIELD CONDITIONS

A. Site Environmental Requirements: Do not install materials until site conditions conform to manufacturer instructions.

1.09 WARRANTY

- A. Conform to Warranty submission requirements noted in Division 01.
- B. Manufacturer: 15-year materials warranty covering defective materials of extruded aluminum framing system.
- 1.10 SOURCE QUALITY CONTROL
 - A. Single Source Responsibility: Furnish engineered design and fabrication by or under direct responsibility of single manufacturer.
 - B. Field Measurements:
 - 1. Verify conditions prior to preparing shop drawings and beginning fabrications.
 - 2. Where this is not practical, verify with dimensions shown on shop drawings and mark corrections prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer: NVELOPE Thermally Broken Cladding Support System by SFS Group USA, Inc. www.us.sfs.com/nvelope. Phone: (610) 790-2675. Email: us.nvelope@sfs.com
 - 1. Nvelope, NV1-System (Vertical/Exposed Fastener) Series Rainscreen System and/or Cladding Support System, thermally insulated and isolated between metal components and substrate, specified as basis of design.
- B. Substitutions: See 012500 PRODUCT SUBSTITUTION PROCEDURES.

2.02 REGULATORY REQUIREMENTS

- A. Design and Structural Properties: Conform to provisions of 2020 International Building Code (IBC) including IBC Section 1604.3.3 and IBC-2020 Section 2211 including applicable referenced AISI specifications and standards, including following as applicable.
 - 1. AISI S100.
 - 2. AISI S200.
 - 3. AISI S211.
 - 4. AISI S212.
 - 5. AISI S213.

2.03 PERFORMANCE / DESIGN CRITERIA

- A. Structural Design: Provide engineered design capable of withstanding combined effects of stresses from dead loads, wind loads, normal thermal movement, and other anticipated stresses without evidence of permanent defects or failure.
 - 1. Wind Load: Uniform pressure (velocity pressure) as indicated on Structural Drawings, acting inward and outward.

- 2. Dead Loads: Design for loading to accommodate support of cladding systems specified by related sections and shown on Drawings and as required by applicable building code.
- 3. Seismic Loads: Design and size components to withstand seismic loads and sway displacement.
- B. Thermal Expansion and Contraction: Design for movement due to cyclic day and night temperatures to not exceed safety factors for fasteners, joints, seals, and components.
- C. Cladding Accommodation: Design framing support assembly to maintain dimensions to face of cladding materials indicated on Drawings. Design framing supports configuration, size, spacing, and make adjustments as needed to accommodate support for each cladding type, including:
 - 1. High-Density Fiber Cement Wall Panels.
 - 2. Metal Cladding.
- D. Rain Screen Design: Design ventilating system assembly to accommodate movement of air movement into the rain screen cavity and move water vapor out.
- E. Tolerances:
 - 1. Accommodate deflection of structural members.
 - 2. Maintain clearances to adjacent construction elements.
 - 3. Prevent load transfer to non-structural elements.
- F. Thermal Barriers:
 - 1. Thermally isolate metal components from each other and support wall.
 - a. Maximum contact area between isolator and sheathing: 3.15 square inches
 - b. Maximum thickness: 0.375 inches
 - c. Shims that may be used for plumb and true alignments must not increase thermal isolation contact area.
 - 2. Thermally isolate fasteners from metal using thermal isolation washers or other means.
 - a. Minimum isolator thickness: 0.125 inches
- G. Thermal Insulation:
 - 1. Design thickness and type of insulation into system assembly.
 - 2. Perform thermal analysis to determine framing systems effect on wall assembly.
- H. Effect on Wall Assemblies Thermal Resistance: Framing system must not degrade complete wall assemblies thermal resistance by more than 17 percent and conform to ASHRAE 90.1 prescriptive U-value of wall assembly for the applicable climate zone.
 - 1. Three dimensional computer simulated thermal analysis or guarded hot-box test (ASTM C1363) results required.
- I. Fire Propagation Performance: Meeting conditions of acceptance for NFPA 285.

2.04 EXTRUDED ALUMINUM SUB-FRAMING:

- A. Basis of Design Product: NVELOPE Systems.
- B. Gauge, Configuration, Dimensions, and Spacing: Minimum gauge and as required to conform to design criteria for each assembly.
 - 1. Material: Alloy 6005A T6 (former designation AlMgSi 0,5 F25) appropriate for rainscreen cladding support / construction
- C. Wall Brackets:
 - 1. Single bracket height: 75 mm, Double bracket height: 150 mm. All brackets shall have pre-punched Holes providing for a minimum of two wall anchors per bracket.
 - 2. Stem for Connecting Rail to Bracket shall not penetrate exterior layer of insulation.

- a. Small bracket dimensions: 3 inches high and 2.5 inches wide. Plate thickness of 6.5mm for steel and wood frame substrate and 11mm for concrete or CMU substrate.
- b. Large bracket dimensions: 6 inches high and 2.5 inches wide. Plate thickness of 6.5mm for steel and wood frame substrate and 11mm for concrete or CMU substrate.
- c. Pre-punched Holes: For engagement and placement of stainless steel self-tapping hex-head screws for use in attaching vertical rail.
- 3. Dimensions: As needed to offset cladding from wall plane where meeting substrate and to allow for installation of insulation equal in thickness to offset.
 - a. Offset Bracket: 90mm depth with up to 40mm of adjustment on the vertical axis.
 - b. Align offsets to differing wall planes as shown on Drawings.
- 4. Basis of Design product: SFS (Nvelope) with Thermal Isolator (color: green)
- D. Vertical Rail: Minimum 2.2mm thick extruded aluminum
 - 1. Profile: T-section for vertical furring members.
- E. Horizontal Rail (NV3 only): Nominal 2.5mm thick extruded aluminum
 - 1. Profile: (CP-NV3-3000) Horizontal Rail
 - 2. Dimensions: (2 3/8") 60mm high and (1") 25mm deep. Intermittent cleat fixed to cladding panel are mated to horizontal rail. When engaged, total depth is (1") 26mm.
 - 3. Attachment Holes: Cleats are factory-punched to accommodate fastener spacing and dimension.
 - a. Oversize holes to allow for thermal contraction and expansion of rail.

2.05 THERMAL ISOLATOR

- A. Material: Injection molded Polypropylene copolymer.
- B. Size: To accommodate plate.
 - 1. Framing member to framing member isolation: minimum 0.125 inch thick
 - 2. Isolator must match support bracket and must not decrease structural performance of system.
 - 3. Recommended Product: Nvelope NV-T1 or NV-T2 Thermal Isolators by SFS or as recommended by approved system manufacturer.

2.06 CONNECTORS AND ANCHORS

- A. Connectors used with Cold-Formed Steel Framing Members: Conform to ICC-ES AC261
- B. Screw Fasteners: Stainless steel in size and configuration as required by manufacturer.
 - 1. Thermoset Polyester coating that exhibits 1,000 hours of salt spray beyond stainless steel anti-corrosiveness.
 - 2. Minimum No. 14 self-drill hex-head screw fastener to be used to attach horizontal rail to vertical rail.
 - 3. Steel Studs:
 - a. Self-drill hex-head TEK screw fasteners of sufficient length
 - b. Minimum three threads must penetrate steel stud members.
- C. Concrete and Masonry Wall Anchors: Mechanical and Adhesive anchors, bolts, nuts, and washers suited to use and as required for transference of design loads.
 - 1. Mechanical Anchors: Expansion type, conforming to ICC ES AC193.
 - 2. Adhesive Anchors: Torque Controlled, conforming to ICC ES AC308.

2.07 ACCESSORIES

- A. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel or fiberglass, thickness as necessary to meet structural requirements for special conditions encountered.
- B. Galvanic Protection: Utilize tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify conditions ready to receive work of this Section before beginning.
- B. Backup Wall: Verify level and plumb, free of defects, and conforming to tolerances suitable for installation of subsequent work.
- C. Weather Resistive Barrier: Verify complete, cured, and conforming to manufacturer's instructions. Verify fenestration, transitions, discontinuities, and sills and ledgers flashed and sealed to move moisture to exterior of building as part of air barrier system.

3.02 PREPARATION

- A. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.
- B. Adjust and perform work as necessary for plumb and true alignments.

3.03 INSTALLATION

- A. Conform to manufacturer's instructions and provisions of Contract Documents.
- B. Erect cold-formed rain screen assembly to be level, plumb, and in alignment with building features including corners, off-sets, and fenestration.
- C. Wall Brackets and Vertical Rail:
 - 1. Mount wall brackets at 16 inch on center horizontally on support wall (at each stud location), using self-drilling self-tapping screws at metal stud framed walls and expansion or adhesive anchors at concrete and masonry walls.
 - a. Lay brackets out at an even 0.5 inch increment vertically or horizontally.
 - b. Tighten snug tight, approximately 90 in/lbs of torque, and as instructed by fastener manufacturer instructions.
 - c. Where using snug tight criteria, verify torque for each installer using hand tools at beginning of project.
 - 2. Thermally isolate wall bracket attachments by sandwiching thermal break material between metal bracket and support wall substrate.
 - 3. Isolate screw fastener washers using material to thermally isolate fastener heads from metal bracket.
 - 4. Attach horizontal rail to wall bracket stem by use of a self-tapping screw fastener through the pre-punched holes in the rail and into the pre-punched pilot holes on the bracket.
 - 5. Isolate horizontal rail from bracket by sandwiching a thermal break material between rail and bracket stem.
 - 6. Place shims the same size and profile as the isolator between the sheathing and bracket isolator to account for irregularities in support wall.

- 7. Establish and re-establish and restart vertical bracket locations using laser or chalk-line at fenestration and other obstructions to establish horizontal alignments. Brackets must be placed at 0.5 inch increments vertically or horizontally.
- D. Horizontal Rail:
 - 1. Space to make suitable bearing surfaces for each cladding system as instructed by manufacturer and as shown on Architect accepted shop drawings.
 - 2. Begin at bottom and mount to vertical rails using No. 14 self-drilling self-tapping stainless steel screws.
 - 3. Tighten screws to snug tight, typically between 90-95 in/lbs of torque. Verify equivalent snug tight condition for installers using hand tools.
 - 4. Install successive horizontal rails as required for panel type.
 - 5. When encountering fenestration and other openings, mount horizontal rails so that fastening points are as close to the lower and upper edges as possible.
- E. Semi-Rigid Mineral Wool Insulation: Install to expand into and tightly fit between wall brackets to make continuous, unbroken insulated face of wall.
- F. Touch-up shop-applied protective coatings damaged during handling and installation with compatible repair finish material.
- G. Use shearing instruments (i.e. snips, nibbler, etc.) for cutting metal framing components. Saws shall not be used. Protect the anti-corrosion coating throughout the cutting process.
- H. Vertical rails shall be installed to maximize the lengths of each rail with a minimum permissible length for vertical rails of 12 inches with mechanical attachment to at least two separate wall brackets.
- I. Horizontal rails shall be installed to maximize the length of each rail with a minimum permissible length of horizontal rails of 12 inch with mechanical attachment to at least two separate vertical rails to prevent rotation of rail.
 - 1. At unsupported span of installed horizontal rails that extend past closest vertical rails, do not exceed 7.5 inch in length for 16 inch on center spaced studs or 11.5 inch in length for 24 inch on center spaced studs.
 - 2. At opening jambs (windows, doors, and other fenestration) do not extend the horizontal rails past vertical rails by more than 3 inch in length.

3.04 ERECTION TOLERANCES

- A. Maximum framing member variation from True or plumb position: 1/8 inch unless required by the drawings.
- B. Maximum framing member variation from plane:
 - 1. Individual Framing Members: Not to exceed 1/8 inch in 10 foot.
 - 2. Cumulative overall variation for Wall and Floor Systems: Not to exceed 1/8 inch.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Technical Service: Make intermittent and final inspection to verify installation in conformance to manufacturer instructions and suitable as framing assembly for subsequent metal panels, acrylic plastering, and other cladding installations.
 - 1. Confirm snug tight and fastener sizing.
 - 2. Confirm framing members installed in correct orientation.

3.06 ADJUSTING

- A. Inspect and adjust after installation. Replace or repair defective work.
- B. Adjust, and reconfigure as necessary to accommodate cladding systems for installations over work of this Section. Do not reuse pre-drilled holes unless fastener size is increased.

END OF SECTION

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-applied, emulsified-asphalt dampproofing.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit 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 cured.

PART 2 - PRODUCTS

- 2.01 MATERIALS, GENERAL
 - A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide molded-sheet drainage panels auxiliary materials recommended in writing by manufacturer of primary materials.
 - B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.02 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BASF Construction Chemicals Building Systems; Sonneborn Brand Products.
 - 2. ChemMasters, Inc.
 - 3. Euclid Chemical Company (The); an RPM company.
 - 4. Henry Company.
 - 5. Karnak Corporation.
 - 6. Koppers Inc.
 - 7. Meadows, W. R., Inc.
- B. Trowel Coats: ASTM D1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.03 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C578, Type X, 1/2 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. 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 the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

3.03 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
- C. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
- D. 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 wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal. /100 sq. ft. for first coat and 1 gal. /100 sq. ft. for second coat one fibered brush or spray coat at not less than 3 gal. /100 sq. ft.

3.05 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course on same day of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.06 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

H2M

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. Extruded Polystyrene foam board insulation.
 - 2. Glass-fiber blanket insulation.
 - 3. Mineral-wool blanket insulation.

1.03 ACTION SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Manufacturer's Certificate: Certify panels will conform to specified performance requirements.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.06 PRE-INSTALLATION MEETING

- A. Pre-Installation Meeting: Convene minimum one week prior to commencing Work of this section. Review installation procedures and coordination required with Related Work and include the following:
 - 1. Participants: Authorized representatives of the Contractor, Architect, Installer, and Manufacturer.
 - 2. Review wall assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
 - 3. Review continuous insulation wall panels installation methods and procedures related to application, including manufacturer's installation guidelines.
 - 4. Review firestopping requirements and weather resistive membrane requirements and placement locations.
 - 5. Review field quality control procedures.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.
- C. 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 FOAM-PLASTIC BOARD INSULATION
 - A. Extruded-Polystyrene Board Insulation: ASTM C578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84, Class A.
 - 1. Products:
 - a. DuPont de Nemours, Inc. Chemical Company; STYROFOAM HIGHLOAD 100: www.DuPont de Nemours, Inc.buildingsolutions.com/#sle.
 - b. Owens Corning Corporation: FOAMULAR NGX 1000(100 psi compressive strength): www.ocbuildingspec.com/#sle.
 - c. Substitutions: See Section 016100 Product Requirements and Section 012500 Substitution Procedures.
 - 2. Type V: 100.0 psi (Compressive strength), 3.00 pcf (Density) minimum.
 - 3. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 4. Type and Thermal Resistance, R-value: Type V, 5.0, (0.88) per 1 inch thickness at 75 degrees F mean temperature.
 - B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
 - C. Tape joints in rigid insulation with Henry Blueskin SA or equivalent material as recommended by the approved insulation manufacturer.

2.02 GLASS-FIBER BLANKET INSULATION

- 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. Johns Manville.
 - 2. Knauf Insulation.
 - 3. Owens Corning.
- 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. Facing: Kraft
 - 3. Thermal resistance (R-Value) of minimum R-21, unless indicated otherwise. Thermal resistance value is exclusive of exterior insulation values.
 - 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 MINERAL-WOOL BLANKET INSULATION

- A. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 - 3. Products:
 - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
 - b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
 - c. ROCKWOOL (ROXUL, Inc); AFB evo™: www.rockwool.com/#sle.
 - d. Thermafiber, Inc; SAFB FF: www.thermafiber.com/#sle.
 - e. Owens Corning.- Thermafiber® RainBarrier HD (R-4.3 per inch, 6.0 pcf.)
 - 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.
- B. Mineral-Wool Blanket Cavity Insulation: CAVITYROCK; ASTM C612 Type IVB, Class A (faced surface with a flame-spread index of 25 or less per ASTM E84);
 - 1. Size: 16 inches or 24 inches wide as indicated on the drawings x 48 inch lengths.
 - 2. Thickness: 3 inches as required by the drawings.
 - 3. Density:
 - a. Outer layer: 6.24 pcf, ASTM C612.
 - b. Inner layer: 4.1 pcf, ASTM C612.
 - 4. R value: 4.2 per inch (1 and 2 inch thick products) and 4.3 per inch for 2.5 to 6 inch thicknesses.
 - 5. Note: Provide CAVITYROCK BLACK where indicated on the drawings and at all Rainscreen applications.

2.04 INSULATION FASTENERS

- A. Insulation Fasteners: Lengths of galvanized, 13 gauge, 0.072 inch (1.83 mm) high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.
- B. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- C. Wire Mesh: Galvanized steel, hexagonal wire mesh.
- D. Adhesive: Gun grade, interior and exterior, and compatible with insulation and substrates; complies with ASTM C557.
 - 1. Application Temperature: 40 to 100 degrees F (5 to 38 degrees C) at contact surfaces.
 - 2. Volatile Organic Content (VOC): Less than 7 percent by weight.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

2.05 GRADE PROTECTION FLASHING

- A. Description: Non-corrosive PVC protection for exposed 2" rigid insulation materials where below grade insulation extends to meet wall construction.
- B. Manufacturer:

- 1. EnergyEdge, LLC 7701 East Kellogg Suite #722 Wichita, KS 67207 316-618-1983 info@eeform.com
- 2. ; or approved equal
- C. Finish: Solid core "concrete" grey UV protected exterior grade PVC.
- D. Properties: Material resistant to UV exposure, water, snow, fertilizers, insects, rodents, lawn chemicals, and is freeze resistant.
- E. Size: EF-217
 - 1. 10' long sections
 - 2. Vertical cover: 13-3/4"
 - 3. Top Return: 2-3/16"

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 48 inches in from exterior walls.
- C. Grade Protection Flashing
 - 1. Insure positive flow away from building and is placed below slab elevation.
 - 2. Avoid extreme heat or cold during installation.
 - 3. Heat material as neccesary for pending, drilling, cutting, and other impact operations to avoid cracking.
 - 4. May be cut with a table, chop, or raidal arm saw, use new blades to produce a clean form edge.

- 5. Install with top edge leveled with desired insulation level. A slight slope may be applied to insure positive drainage.
- 6. Overlap at joints by 1-1/2" and secure with color matched self tapping screws.

3.04 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04

3.05 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
 - b. Interior Walls: Set units with facing placed toward areas of high humidity.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.06 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.07 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

- 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
- 2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
- 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
- 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.08 CLEANING

- A. Progress Cleaning: Perform cleanup as work progresses in accordance with Section 011400 WORK RESTRICTIONS.
- B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 017423 CLEANING.

3.09 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

2/25/2025 4:17 PM

Issue Date: 02-25-2025

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. This Section specifies stone fiber board insulation for exterior non-structural commercial and building construction insulation sheathing applications.

1.02 RELATED REQUIREMENTS

- A. Section 070543 Cladding Support System.
- B. Section 07464.11 Cement Wall Panels

1.03 REFERENCES

- A. ASTM C1104/C1104M Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation; 2019.
- B. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019.
- C. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2023.
- D. ASTM C303 [2010], Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
- E. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2022.
- F. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- G. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- H. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- I. ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- J. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- K. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this Section with roofing or deck work and with work of other trades for proper time and sequence to avoid construction delays.
- B. Pre-installation Meeting: Convene pre-installation meeting after Award of Contract and one week before starting work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's written installation instructions.

- 1. Comply with Section 013119 PROGRESS MEETINGS and co-ordinate with other similar pre-installation meetings.
- 2. Notify attendees 2 weeks prior to meeting and ensure meeting attendees include as minimum:
 - a. Owner;
 - b. Consultant;
 - c. Board Insulation Installation Subcontractor;
 - d. Manufacturer's Technical Representative.
- 3. Ensure meeting agenda includes review of methods and procedures related to insulation installation including co-ordination with related work.
- 4. Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- A. Make submittals in accordance with Section 013300 SUBMITTALS.
- B. Product Data: Submit product data including manufacturer's literature for insulation materials and accessories, indicating compliance with specified requirements and material characteristics.
 - 1. Submit list on insulation manufacturer's letterhead of materials and accessories to be incorporated into Work.
 - 2. Submit SDS Safety Data Sheets for product.
 - 3. Include product name.
 - 4. Include preparation instructions and recommendations, installation methods, and storage and handling requirements.
 - 5. Include contact information for manufacturer and their representative for this Project.
- C. Samples: Submit 6 by 6 inches minimum sample of insulation in thickness used on Project.
- D. Test Reports: Submit evaluation service reports, if available, or other independent testing agency reports showing compliance with specified performance characteristics and physical properties.
- E. Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer representative's site visit and inspection.
- F. Textured Finishes: 6 by 6 inches sample for each textured finish indicated and on same backing indicated for Work.
- G. Insulation Installer Qualifications: Submit letter verifying insulation installer's experience with work similar to work of this Section.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Supply maintenance data for insulation materials for incorporation into manual specified in Section 017800 - CLOSEOUT SUBMITTALS.

1.07 QUALITY ASSURANCE

A. Board Insulation Installer Quality Assurance: Work experience of [5] years minimum with work similar to work of this Section.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Deliver material in accordance with Section 016100 BASIC PRODUCT REQUIREMENTS.
 - 2. Deliver materials and accessories in insulation manufacture's original packaging with identification labels intact and in sizes to suit project.
 - 3. Ensure insulation materials are not exposed to moisture during delivery.
 - 4. Replace wet or damaged insulation materials.
- B. Storage and Handling Requirements: Store materials off ground in dry location and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Store in original packaging until installed.
- C. Packaging Waste Management:
 - 1. Separate and recycle waste packaging materials in accordance with Section 017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
 - 2. Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.
 - 3. Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling in accordance with Waste Management Plan.

1.09 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.
- C. Warranty period: 1 year(s) commencing on Date of Substantial Performance of Work.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: ROCKWOOL, 8024 Esquesing Line, Milton, Ontario, L9T 6W3, Phone: 905-878-8474, Toll Free: 1-800-265-6878, e-mail: <u>contactus@rockwool.com</u>, URL: <u>www.rockwool.com</u>.
- B. or Architect Approved equivalent.

2.02 DESCRIPTION

A. Rigid, water repellent, mineral wool insulation board for exterior non-structural commercial and industrial high performance insulation sheathing applications to ASTM C612, Type IVB.

2.03 PERFORMANCE CRITERIA

- A. Board insulation for continuous insulation systems: ASTM C612, Type IVB.
- B. Fire Performance:
 - 1. Surface Burning Characteristics, ASTM E84:
 - a. Flame spread: 0

- b. Smoke developed: 0
- C. Thermal resistance (R value/inch at 75 ° F: 4.0 hr ft2 F/Btu, ASTM C518.
- D. Moisture resistance:
 - 1. Moisture sorption: 0.05% maximum to ASTM C1104.
 - 2. Water vapor transmission: 31 perm to ASTM E96, Desiccant Method.
- E. Corrosive resistance:
 - 1. Steel, ASTM C665: Non-corrosive.
 - 2. Stainless steel, ASTM C795: Non-corrosive.
- F. Density: 8.0 lb/ft3, ASTM C303.
- G. Compressive strength: ASTM C165
 - 1. 439 psf at 10%.
 - 2. 1065 psf at 25%.
- H. Recycled content: 16% minimum.
- I. Fungi resistance: ASTM C1338.
- J. Acoustical performance sound absorption co-efficients, ASTM C423.

Sound Absorption Co-efficiences at Frequencies:

| Thickness (inches) | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | NRC |
|-----------------------|--------|--------|--------|---------|---------|---------|------|
| 1 1/2 | 0.21 | 0.64 | 0.92 | 1.00 | 1.00 | 1.01 | 0.90 |
| 2 | 0.43 | 0.78 | 0.90 | 0.97 | 0.97 | 1.00 | 0.90 |
| 3 | 0.75 | 0.82 | 0.89 | 0.94 | 1.00 | 1.00 | 0.90 |

2.04 MATERIALS

- A. Rigid, water repellent, mineral wool insulation board, ASTM C612, Type IVB.
 - 1. Size: 24 by 48 inches, 36 by 48 inches, 48 by 72 inches, and 48 by 96 inches.
 - 2. Thickness(es): 1 1/2 inches, 2 inches, and 3 inches.
- B. Acceptable Material: ROCKWOOL, COMFORTBOARD[™] 80.
 1. Architect Approved equivalent.

2.05 ACCESSORIES

A. Mechanical fasteners in accordance with insulation manufacturer's written recommendations.

2.06 SOURCE QUALITY CONTROL

- A. Ensure insulation components and accessories are supplied or approved in writing by single manufacturer.
- 2.07 PRODUCT SUBSTITUTIONS
 - A. Substitutions: See 012500 PRODUCT SUBSTITUTION PROCEDURES.

PART 3 - EXECUTION

3.01 INSTALLERS

A. Use only installers with 5 years minimum experience with work similar to work of this Section.

3.02 EXAMINATION

- A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for insulation installation in accordance with manufacturer's written recommendations.
 - 1. Visually inspect substrate in presence of Consultant.
 - 2. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
 - 3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
- B. Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.03 INSTALLATION

- A. Install insulation in accordance with manufacturer's written recommendations.
- B. Install insulation to maintain continuity of thermal protection to building elements and spaces.
- C. Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures, and minimum 50mm from sidewalls of chimneys and vents.
- D. Refer to insulation manufacturer's current installation guide for detailed information regarding installation.

3.04 FIELD QUALITY CONTROL

- A. Inspection: Coordinate field inspection in accordance with Section 014500 QUALITY CONTROL.
- B. Manufacturer's Services:
 - 1. Coordinate manufacturer's services with Section 014500 QUALITY CONTROL.
 - a. Arrange for payment for manufacturer's services.
 - b. Have manufacturer review work involved in handling, installation, protection, and cleaning of insulation and accessories, and submit written reports in acceptable format to verify compliance of Work with Contract conditions.
 - 2. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.
 - a. Report any inconsistencies from manufacturer's recommendations immediately to Consultant.
 - 3. Schedule site visits to review work at stages listed:
 - a. After delivery of insulation materials, and when preparatory work on which Work of this Section depends is complete, but before installation begins.
 - b. Twice during progress of work at 25% and 60% complete.
 - c. Upon completion of Work, after cleaning is carried out.
 - d. Obtain reports within three days of review and submit immediately to Consultant.

3.05 CLEANING

- A. Progress Cleaning: Perform cleanup as work progresses in accordance with 017423 CLEANING.
 - 1. Leave work area clean at end of each day.
- B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment in accordance with 017423 CLEANING.
- C. Waste Management:
 - 1. Coordinate recycling of waste materials with Section 017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
 - 2. Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.
 - 3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.06 PROTECTION

- A. Protect installed products and accessories from damage during construction.
- B. Repair damage to adjacent materials caused by insulation installation.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.
- B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
 1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.
- D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.03 REFERENCE STANDARDS

- A. AATCC Test Method 127 Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).
- B. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- C. ASTM D1970/D1970M Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- E. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.
- F. ASTM E2178 Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- G. ICC-ES AC38 Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2019).
- H. ICC-ES AC148 Acceptance Criteria for Flexible Flashing Materials; 2017.
- I. ICC-ES AC212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015.

1.04 SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- E. Manufacturer's Installation Instructions: Indicate preparation.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.
- H. Testing Agency Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Air Barrier:
 - 1. On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating.
 - 2. On outside surface of sheathing of exterior walls use air barrier coating.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier Sheet, Mechanically Fastened:
 - 1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
 - 3. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
 - 4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 180 days weather exposure.

- 5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
- 6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
- 7. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
- 8. Products:
 - a. DuPont Building Innovations; Tyvek Commercial Wrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: www.dupont.com.
 - b. Or approved equal.
- B. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
 - 1. Air Barrier Coating:
 - a. Material: Acrylic.
 - b. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
 - c. Water Vapor Permeance: 5 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - d. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure after application.
 - e. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
 - f. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - g. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
 - h. VOC Content: 50 g per L or less.
 - i. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
 - j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 - k. Products:
 - 1) Parex USA, Inc.; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/sle.

2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Flexible Flashing: Sheathing fabric saturated with air barrier coating and complying with the applicable requirements of ICC-ES AC148.
 - 1. 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.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
 - 2) 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.

- D. Liquid Flashing: One part, fast curing, non-sag, gun grade, trowelable liquid flashing.1. Products:
 - a. Parex USA, Inc.; Parex USA WeatherTECH with WeatherFlash: www.parexusa.com/sle.
- E. Thinners and Cleaners: As recommended by material manufacturer.
- F. 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 that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Mechanically Fastened Sheets On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
 - 4. Attach to masonry construction using mechanical fasteners spaced at 12 to 18 inches (305 to 460 mm) on center vertically and maximum 24 inches (610 mm) on center horizontally.
 - 5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 - 6. Install air barrier and vapor retarder UNDER jamb flashings.
 - 7. Install head flashings under weather barrier.
 - 8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- D. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch (6 mm); use sheet seal to join to adjacent construction, seal air tight with sealant.
 - 3. Use flashing to seal to adjacent construction and to bridge joints.
- E. Openings and Penetrations in Exterior Weather Barriers:

- 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
- 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches (100 mm) wide; do not seal sill flange.
- 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
- 4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
- 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
- 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 014500 QUALITY CONTROL, for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.
- C. Do not cover installed weather barriers until required inspections have been completed.
- D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- E. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 05 40 00 Cold-Formed Metal Framing.
- B. Section 06 10 00 Rough Carpentry.
- C. Section 07 05 43 Cladding Support Systems.
- D. Section 07 21 13 Mineral Fiber Board Insulation.
- E. Section 07 62 00 Sheet Metal Flashing and Trim.
- F. Section 07 92 00 Joint Sealants.

1.02 REFERENCES

- A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method (NRC)
 - 2. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - 3. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
 - 4. ASTM E283-04 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - 5. ASTM E331-00 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 - 6. ASTM E1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers (LRV)
 - ASTM E2768-11 Standard Test Method for Extended Duration Surface Burning Characteristics for Building Materials (30 min Tunnel Test). Results: Zero Flame Spread, Smoke Developed Index of 5. Meets criteria for Class A fire rating
- B. UL & Underwriters Laboratories of Canada (UL/ULC)
 - 1. UL 723, Standard Method of Test for Surface Burning Characteristics of Building Materials
 - 2. CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - 3. CAN/ULC S114, Standard Test Method for determination of non-combustibility in building materials
- C. 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
 - 2. AAMA 2604 Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels
 - 3. AAMA 509 Voluntary Test and Classification Method for Drained and Back Ventilated Rainscreen Wall Cladding Systems
 - 4. AAMA 501.1-17 Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
 - 5. International Code Council Evaluation Service (ICC-ES)
 - 6. ICC-ES Evaluation Report

1.03 SUBMITTALS

- A. Product data: submit manufacturer's printed product literature, specifications and data sheet.
- B. Submit duplicate 6 inch X 6 inch (152mm x 150mm) samples of cladding material, of color and profile specified.
- C. Shop drawings to indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
- E. Submit manufacturer's installation instructions.

1.04 WARRANTY

- A. Provide a written guarantee, signed and issued in the name of the owner, covering the metal cladding/cladding material for 15 (fifteen) years from the date of Substantial Completion.
- B. The manufacturer's warranty is limited to replacement of defective material only, rather than installation of the same. Faulty installation shall be corrected by the installing contractor. The warranty required herein is the sole remedy against the manufacturer and there are no other implied warranties. In any event, the manufacturer shall not be liable for incidentals or consequential damages.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Longboard Architectural Products #120 1777 Clearbrook Rd.
 - 1. Abbotsford, BC, Canada V2T 5X5
 - 2. info@longboardproducts.com
 - 3. 1.800.604.0343
- B. Or Architect approved equal.

2.02 ALUMINUM CLADDING AND COMPONENTS

- A. 6-inch (152mm) V-Groove planks extruded aluminum 6063 T5
 - 1. Finish coating: powder coated finish
 - 2. Color: Woodgrain Collection #2, Table Walnut.
 - 3. Gloss: 30 ± 5.
 - 4. Thickness: 1/16 inch (1.57mm) base metal thickness.
 - 5. Profile: 6-inch (152mm) V-Groove X 24 ft (7315.2mm) plank

2.03 ACCESSORIES

A. 3" STARTER STRIP, 5/8" STARTER J-TRACK, 5/8" J-TRACK, 5/8" TWO PIECE J-TRACK, 1-3/8" TWO PIECE J-TRACK, 3/4" INSIDE CORNER, 1" OUTSIDE CORNER, 2" CORNER SET, 3/16" OUTSIDE CORNER, 5/8" TERMINATION SET, 1-3/8" TERMINATION SET, 1-3/8" COMPRESSION JOINT, 1/2" FLAT REVEAL, 3/4" U-REVEAL SET, 1-1/2" U-REVEAL SET, 1-1/2" FLAT REVEAL SET, 3/4" T&G U-REVEAL, 1-1/2" T&G U-REVEAL, 1/2" T&G FLAT REVEAL, 2" OFFSET FLAT REVEAL, in same material and finishes as cladding. B. Plank Clips: 316 Stainless steel Quick-Screen Clips that are shipped loose for field installation.

PART 3 EXECUTION

3.01 ORDERING, DELIVERY, STORAGE AND HANDLING

- A. Ordering: Conform to manufacturer's ordering instructions and lead time requirements to avoid construction delays
- B. Deliver materials and components in manufacturers' unopened containers or bundles. Prevent damage during unloading, storing and installation
- C. Store, protect and handle materials and components in accordance with manufacturer's recommendations to prevent twisting, bending, mechanical damage, contamination and deterioration
- D. Stack metal cladding horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal cladding to ensure dryness, with positive slope for drainage of water. Do not store metal cladding in contact with other materials that might cause staining, denting, or other surface damage

3.02 INSTALLATION

- A. Install cladding and components in accordance with manufacturer's written instructions and shop drawings, including product technical bulletins, datasheets and install videos
- B. Install all cladding planks using Quick-Screen Clips in accordance with the manufacturer's written instructions, technical bulletins, datasheets and install videos to not restrict thermal movement at specified o.c. spacings. Install screws in pre-punched holes. Install one (1) hard-fastened screw per plank, directly through the plank flange to prevent plank migration. All fasteners should penetrate into solid, secure framing or blocking
- C. Install components in accordance with the manufacturer's written instructions and shop drawings, including technical bulletins, datasheets and install videos with positive anchorage to building and provide for thermal movement
- D. Install screw fasteners using power tools having controlled torque adjusted to compress Quick-Screen Clips tight without damage or deformation of the Quick-Screen Clips, screw heads, screw threads or cladding
- E. Hard-fasten any and all butt-joints into solid secure framing or blocking, to maintain tight fitting hairline joints. Never exceed one (1) hard-fastener per plank, all other attachment points to use Quick-Screen Clips to not restrict thermal movement
- F. Do not install damaged panels; repair or replace as required

3.03 CLEANING

A. Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Contract, General Conditions and all Sections within Division 01 - General Requirements are applicable to this Section of the Specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: The Work of this Section includes Fibre cement panels of the following types:
 1. Through color high density fibre cement panels.
 - a. Fibre Cement material is a through colored base board, with mechanical surface treatment which results in a structure of raw fibre cement material, which has at the same time a rough yet velvet appearance. The finished panel is both weatherproof and UV-stable.
 - 2. Fastening System:
 - a. Face fixed Fibre Cement Wall Panels with rivets colored to match the panel to a metal supporting frame.
 - b. Face fixed Fibre Cement Wall Panels with screws colored to match the panel to a timber supporting frame
 - c. Invisible concealed Tergo and Tergo+ system to a metal supporting frame.
 - d. Invisible adhesive system to a metal supporting frame.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine Contract Documents for requirements that affect work of this section.

1.04 REFERENCES

- A. ASTM C1186 Standard Specification for Flat Fiber-Cement Sheets; 2022.
- B. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.
- C. ASTM E2226 Standard Practice for Application of Hose Stream; 2015b (Reapproved 2019).
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- E. ASTM G155 Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials; 2021.
- F. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.
- G. ICC-ES AC90 Acceptance Criteria for Fiber Cement Siding used as Exterior Wall Siding.
- H. ISO 9001 Quality Management System
- I. ISO 14001 Environmental Management System
- J. OHSAS 18001 Safety Management System.

1.05 SUBMITTALS

A. Product submittals shall be per Section 013300 - SUBMITTALS.

074646.11 - 1

- B. Product Data: Manufacturer's data sheets on each product to be used, including, but not limited to:
 - 1. Preparation instructions and recommendations for Fibre Cement Wall Panels.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods for the supporting framework and the Fibre Cement Wall Panels.
- C. Shop Drawings: Provide detailed drawings of non-standard applications of fibre cement materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Code Compliance: Documents showing product compliance with local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.
- E. Engineering Calculations: Submit engineering calculations as required by the local building code, showing that the installed panels and attachment system meets the wind load requirements for the project.
- F. Selection Samples: For each finish product specified, two complete sets of 5 1/4" x 2 1/2" (160x65mm) color chips representing manufacturer's full range of colors and patterns.
- G. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the manufacturer.
- B. Color Variations: Irregularities, differences in shade and traces of the manufacturing process are to be expected on the panel surface. The panel receives no coating.
- C. Mock-Up: Provide a full size mock-up minimum 4 feet by 8 feet for evaluation of surface preparation techniques and application workmanship. Mock-up shall include a corner, window sill, jamb and head condition, wall base and wall-roof intersection.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Moving panels that are stacked on pallets should be done with a forklift with wide fork setting or a crane. Ensure the panels are secured to the pallet in a way that will not cause damage. Stacks should be transported under a waterproof cover.
- B. All panel materials must be stored flat on pallets, inside and undercover in dry conditions, protected from weather both rain and direct sunlight and other trades. Stack the pallets in a way so that the panels are ventilated.
- C. Always lift panels off of each other, never slide them over one another, since scratching may occur.

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 absolute limits or which could involve life safety situations.
- B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. The General Contractor or Installer shall be responsible for existing site dimensions. Recorded measurements shall be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.09 WARRANTY

A. Warranty: At project closeout, provide manufacturer's limited ten (10) year warranty covering defects in materials. Warranty is only available when material is installed by an installation contractor trained and approved by the manufacturer's representative.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Basis of Design: Fibre Cement Panels shall be manufactured / supplied by
 - EQUITONE Inc 1731 Fred Lawson Drive, Maryville, TN 37801 Tel: <u>+1 865-268-2705</u>. E-mail: info.usa@equitone.com Web: <u>http://www.equitone.com</u>
 - 2. Requests for substitutions will be considered in accordance with provisions of Section 012500 PRODUCT SUBSTITUTION PROCEDURES.

2.02 WALL PANELS - "NATURA"

- A. Through Color High Density Fiber Cement Panels:
 - 1. Product: EQUITONE "NATURA" Fiber Cement Panel
 - a. Application: Exterior.
 - b. Thickness: 5/16 inch
 - c. Finish: Through colored base board, with mechanical surface treatment which results in a structure of raw fibre cement material, which has at the same time a rough yet velvety appearance. The finished panel is both weatherproof and UV-stable. Irregularities, differences in shade and traces of the manufacturing process are to be expected.
 - d. Color: N961.
 - e. Panel Size: 2'-0" x 10'-0"
 - 2. Physical Characteristics:
 - a. EN 12467 'Fibre-cement flat sheets'.
 - 1) Density:
 - 2) Bending strength @ ambient, perpendicular:
 - 3) Bending strength @ ambient, parallel:
 - 4) MOE @ ambient, perpendicular:
 - 5) Hygric movement 30-95%, mean:
 - 6) Porosity 0-100%:

Minimum 1.65 kg/m³ (103 lb/ft³) 24.0 N/mm² (3,480 lbf/in²) 17.0 N/mm2. (2,465 lbf/in²) > 15,000N/mm2.(> 2.175,570 lbf/in²) 1.60 mm/m. < 20 %.

| | 11) | Durability classification (EN 12467): Strength classification (EN 12467): Fire reaction (EN 13501-1): Impermeability test: Warm water test: | Category A. Class 4. A2-s1-d0; OK. OK. |
|----|---|---|--|
| | | Soak dry test: | OK. OK. |
| | , | Freeze thaw test: | 0.6 W/mK. |
| b. | , | Thermal conductivity: M Testing | 0.0 W/IIIK. |
| υ. | . ASTM Testing 1) ASTM C1185, ASTM C1186 Testing | | |
| | 2) | ASTM C1185, Section 5, Modulus of Rupture | Pass Grade III |
| | | ASTM C1185 Section 6 Density | 111.8 lb/ft ³ (1792.6 kg/m ³) |
| | 4) ASTM C 1185 Section 7 Dimensional Measurements | | |
| | , | (a) Length | Pass |
| | | (b) Width | Pass |
| | | (c) Thickness | Pass |
| | | (d) Edge Straightness | Pass |
| | 5) | ASTM C 1185 Section 8 Moisture Movement | |
| | | (a) 23±2°C, 30±2%RH | 0% |
| | | (b) 23±3°C, 90±5%RH | 0.05% |
| | 6) | ASTM C1185 Section9 Water Absorption | 14.5% |
| | 7) | ASTM C 1185 Section 10 Moisture Content | 3.9% |
| | , | ASTM C1185 Section 11 Water Tightness | Pass |
| | 9) | ASTM C1185 Section 12 Freeze/Thaw | Pass |
| | 10) | ASTM C1185 Section 13 Warm Water | Pass |
| | | | |

2.03 MISCELLANEOUS CLADDING MATERIALS

- A. Perforated Insect/Vermin Screen: Manufacturer's standard.
- B. Building Wrap: Approved Building Wrap complying with local codes for product and installation requirements.
- C. Aluminum Joint Closures and Decorative Corner Profiles: Manufacturer's standard products as detailed. Maximum thickness of non structural finishing profile to be 0.8 mm or 21 gauge.
- D. Panel Fastening:
 - 1. Face Fixed Rivets

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 panel surfaces thoroughly prior to installation. Remove any cutting or drilling dust from the surface of the panel using a micro-soft cloth. This is especially important when panels are being adhesively fixed

B. Prepare surfaces using the methods recommended by Equitone for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved submittals.
- B. For exterior applications, comply with local codes and structural engineer's fastening calculations along with manufacturer's recommendations for fastener spacing.

3.04 EXTERIOR CLADDING FOR RAINSCREEN APPLICATIONS

- A. Detailing Requirements:
 - 1. Air space inlets and outlets are required at top and bottom of building or wall termination and shall be equivalent to a continuous 1/2" to 3/4" (12 mm to 18 mm) to facilitate airflow behind the panels. Do not block vertical airflow at windows, doors, eaves, or at the base of the building. Airflow shall be continuous from bottom to top so there is air movement behind each panel. The minimum cavity width should be at least 25/32" (20mm) for facades up to 33' (10m) high. For facades between 66'-165' (20-50 m) the cavity width needs to increase to 1 3/16" (30mm). Air flow behind the Fibre cement panels is critical to the performance of the rain screen constructions.
 - 2. Fasteners in profile shall accommodate thermal expansion/contraction of metal and not interfere with panel application.
 - 3. Install panels starting from top of building and work down the facade.
 - 4. For straight walls, start panel installation in center and work outward.
 - 5. For walls with inside corners, start installation at corner and work across wall.
 - 6. Pattern: Straight pattern with vertical panels. Panel size as indicated.
- B. Rain Screen Installation: Comply with manufacturer's installation requirements.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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. Ethylene-propylene-diene-monomer (EPDM) roofing system.
 - 2. Roof edge systems.
 - 3. Cover Board.
 - 4. Tapered Roof insulation.
 - 5. Roof Insulation.
 - 6. Fire Thermal Barrier.
 - 7. Vapor retarder.
 - 8. Walkway Systems.
 - 9. Expansion Joints.

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 01 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 shall 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 01 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. Preinstallation Roofing Conference: 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.
 - 13. Asbestos abatement work coordination.
 - 14. Debris removal procedures and requirements.

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, elevations, 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's and patterns for mechanically fastened roofing.

- 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Samples for Verification: For the following products:
 - 1. Membrane roofing, of color required, 12 inch x 12 inch.
 - 2. Insulation Board 12" x 12" sample.
 - 3. Cover Board 12 inch x 12 inch.
 - 4. Walkway pads or rolls, of color required.
- E. Manufacturers complete installation Instructions.
- F. 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:
 - Comply with Factory Mutual System Approval Guide to provide FMRC-Approved roof assembly meeting Class 1A-120 (FM 4470) requirements for fire resistance and wind uplift in accordance with FM Loss Prevention Data Sheets FM DS 1-28, FM 1-49 and FM DS 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) 1A-120 Compliance/Roof Assembly.
- D. Qualifications.
 - 1. Manufacturer: Company specializing in manufacturing the products specified in this section with Ten (10) years documented experience.
 - 2. Applicator: Company specializing in performing the work of this section with Five (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, edge materials, copings, and other components of roofing system.
 - 2. Warranty Period: Twenty (20) 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.
 - 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.
- B. Warranty: This project is being constructed in an existing Commercial Building with and EPDM roof having an in-place existing warranty. Contractor will be required to provide a roofing contractor that is approved by the existing roofing manufacturer. Contractor shall maintain and modify existing warranty to include the work required by this project. Contractor shall meet with and provide for all required meetings, and construction inspections by an authorized Field Representative from the Roofing manufacturer issuing and modifying / extending the current warranty. Contractor shall provide to the building owner (with a copy to the Tenant), an original Warranty copy signed by a current authorized representative of the Roofing manufacturer at the completion of the work and prior to final payment claim submittal.

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 G154, 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. Corner Uplift Pressure: -38.2lbf/sq. ft.
 - 2. Perimeter Uplift Pressure: -45.9lbf/sq. ft.
 - 3. Field-of-Roof Uplift Pressure: -56.2lbf/sq. ft.
- 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. EPDM: ASTM D4637/D4637M, Type II, scrim or fabric internally reinforced, uniform, flexible EPDM sheet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by 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. Elevate; Holcim Solutions and Products US, LLC: Black Rubberguard EPDM
 - b. Carlisle SynTec Incorporated.
 - c. Johns Manville.
 - d. Versico Incorporated.
 - 3. Thickness: 60 mils, nominal.
 - 4. Exposed Face Color: Black.

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 (1.4 to 1.5mm) 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. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6 inch (75mm) wide minimum, butyl splice tape with release film.
- F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- G. Molded Pipe Flashings inside and outside corner flashing: as recommended by membrane manufacturer.
- H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

- I. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 inch by 1/8 inch (25mm by 3mm) thick; with anchors.
- J. 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.
- K. 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.
- L. Roof edge and coping system materials: Material shall be as specified herein or in Section(s) 077200 ROOF ACCESSORIES; Coping Covers, Scuppers, Flashings and Roof edge systems shall be included in the Roofing manufacturer's Twenty (20) year Total System NDL Warranty. Kynar finish for all metal components shall be as selected by Architect. Provide complete system with concealed cover plate, extenders, Factory-fabricated corners, end caps and fasteners.

2.05 SUBSTRATE BOARDS / THERMAL BARRIER

- A. Substrate Board / Thermal Barrier: ASTM C1278/C1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 5/8 inch (16 mm) thick.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific; DensDeck Prime Roof Board.
 - b. USG Corporation; Securock Gypsum-Fiber Roof Board.
 - c. Architect approved equivalent.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470, designed for fastening substrate panel to roof deck.

2.06 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.

2.07 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. Minimum LTTR of 30 required.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Elevate; Holcim Solutions and Products US, LLC; Tapered ISO 95+ TM GL Insulation.
 - b. Carlisle Syntec Systems: InsulBase Polyisocyanurate insulation.
 - c. Or approved equal.
- C. Vacuum Insulated Panels: ASTM C165, ASTM C1667, and ASTM D2126 Certified
 - 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 Systems: OPTIM-R Vacuum Insulated Panel (VIP) by Kingspan
- b. Architect approved equivalent.
- 2. System Design:
 - a. 1/2" SecurShield HD panels must be installed above and below the OPTIUM-R panels.
- 3. Panel Characteristics:
 - a. Panel Thickness: 0.79 inch (20mm) and 1.57 inches (40mm)
 - b. Panel R-Value: 26 for 0.79 inch (20mm) panel and 49 for 1.57 inch (40mm) panel
 - c. Panel Width: 11.8 inches (300mm) and 23.6 inches (600 mm).
 - d. Panel Length: 11.8 inches (300mm) and 47.2 inches (1200mm)
 - e. Panel Mass (density) w/o HD panels: 0.82 psf for 0.79 inch (20mm) panel and 1.43 psf for 1.57 inch (40mm) panel
 - f. Compressive Strength (Insulation only): 25 psi (ASTM C165)
- 4. Limitations:
 - a. Panels cannot be mechanically fastened.
 - b. Panels cannot be cut or punctured.
- D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to minimum slope of 1/4 inch per 12 inches (1:48) for new roof installations (unless otherwise indicated for re-roofing projects). Minimum LTTR-30, 4' x 4' board size.
- E. 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.

2.08 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. Flexible FAST Adhesive: Sure-Seal FAST 100 or 100 LV Adhesive: A low rise two-component spray-applied or extruded bead applied, to approved insulations to compatible substrates (concrete, cellular lightweight insulating concrete, gypsum, cementitious wood fiber, wood or steel) or sooth or gravel surfaced BUR, modified bitumen or cap sheets.
- D. Cover Board: ASTM C1278/C1278M, cellulosic-fiber reinforced, water-resistant gypsum substrate, 5/8 inch.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific; DensDeck Prime Roof Board.
 - b. USG Corporation; Securock Gypsum-Fiber Roof Board.
 - c. Securshield HD Plus Coverboard.

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 manufacturer's requirements.
- 4. Concrete Decks:
 - a. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - b. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - c. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- 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 SUBSTRATE BOARD / THERMAL BARRIER INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.05 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.

3.06 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. Form crickets and saddles as indicated on approved roof installation shop drawings.
- D. Install insulation under area of roofing to achieve required LTTR of 30 minimum. 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.
- 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.
- G. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- H. Mechanically Fastened Insulation: Install insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
- I. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- J. 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.

3.07 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow 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.

3.08 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.

3.09 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.

3.10 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

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. Drip edges.
 - 2. Base and Counter 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; 2020.
- C. ASTM B370 Standard Specification for Copper Sheet and Strip for Building Construction; 2022.
- 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 through wall scuppers including section details, dimensions of scupper openings and height above finished roof surface, edge sealing details, interface and

sealing with roof membrane system, counterflashing and exposed exterior fascia conditions.

- 11. 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. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
- D. 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. Metal Copings, Gravel Stops, scuppers, 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 Metal Copings, Gravel Stops, Scuppers, 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 maunfacturer's full range of color offerings.
 - 3. Color: as selected by the Architect from the maunfacturer's full range of color offerings.

4. 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.

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 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. Aluminum: 0.032 inch thick. Finish color as selected by the Architect

2.07 MISCELLANEOUS FLASHINGS - COORDINATED SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Aluminum Sheet: 0.040 inch thick. Finish color as selected by the Architect.

2.08 GENERAL FINISH REQUIREMENTS

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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 wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal joints as required for watertight construction.
 - 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.

3.04 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.

3.05 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 Contract Drawings. Slightly pitch pans towards pan drain location. Pipe and install drain line to plumbing waste or drainage system.

3.06 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.

3.07 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Soldering operations: 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. Upon completion of sheet metal flashing and trim installations, 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

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 curbs.
 - 2. Equipment supports.
 - 3. Roof hatches.
 - 4. Pipe supports.
 - 5. Preformed flashing sleeves.
 - 6. Rooftop Anchorage Connection system.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: 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.

1.04 ACTION SUBMITTALS

- A. See Section 013300 SUBMITTALS, for Submittal Procedures.
- B. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For 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.

1.05 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.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.07 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.08 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: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 METAL MATERIALS

- A. Aluminum Sheet: ASTM B209, 0.063 inch thickness or as indicated, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Mill Finish: As manufactured.
 - 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 - 3. Baked-Enamel Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 4. Kynar 70% PVDF Premium Coastal, Two-coat Fluoropolymer coating with primer to maintain Warranty within 1500 feet of the coastline, AAMA 2605.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Stainless-Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.
- C. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

2.02 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C1289, thickness as indicated.
- C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Underlayment:
 - 1. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
 - 2. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D4397.
 - 3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
- E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened.

Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

- 1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F 2329.
- 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- 3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
- 4. Fasteners for Stainless-Steel Sheet: Series 316 stainless steel.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- H. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- I. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.03 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.
 - 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. Thybar Corporation
 - b. Greenheck Fan Corporation
 - c. Pate Company (The)
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Aluminum sheet, 0.090 inch thick airtight and watertight welded corners.
 - 1. Insulation: 1 1/2 inch thick, 3 lb density rigid insulation.
 - 2. Height: 12 inch minimum above deck or as indicated.
 - 3. Curb Type: TC-3 (No Cant)
- D. Construction:
 - 1. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 2. Fabricate curbs to minimum height of 12 inches above roof elevation unless otherwise indicated.
 - 3. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange. Contractor to field verify roof conditions prior to ordering curb.

2.04 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated

on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

- 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. <u>Thybar Corporation</u>
 - b. Greenheck Fan Corporation
 - c. <u>Milcor Inc.;</u> Commercial Products Group of Hart & Cooley, Inc
 - d. Pate Company (The)
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported. Curb shall span a minimum of two structural supports and shall cantilever a maximum of 12 inches where necessary.
- C. Loads: Coordinate and verify load requirements with approved manufacturer's Product Data for each piece of equipment requiring support.
- D. Material: Aluminum sheet, 0.090 inch thick, airtight and watertight welded corners . Internally reinforced with bulkheads at 24 inches on center, 2 inch x 4 inch wood nailer with 18 gauge flashing cover.
 - 1. Insulation: 1 1/2 inch thick, 3 lb density rigid insulation.
 - 2. Height: 12 inch minimum above deck or as indicated.
 - 3. Curb Type: TEMS-3 (No Cant) for Single Ply Roofing and TEMS-1 (Cant with Shoulder) for SBS Roofing systems.
- E. Construction:
 - 1. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
 - 2. Fabricate equipment supports to minimum height of 12 inches unless otherwise indicated.
 - 3. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.
 - 4. Security Grille: Provide where indicated.

2.05 ROOF HATCH

- A. Roof Hatches: Thermally broken metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. <u>Bilco Company (The)</u>
 - b. Acudor Products, Inc.
 - c. <u>Babcock-Davis</u>
- B. Model (Size): NB-50TB (30 inches by 54 inches)
- C. Type: Single-leaf lid, Thermally Broken.
- D. Loads: Minimum 40-lbf/sq. ft. external live load and 25-lbf/sq. ft. internal uplift load.
- E. Hatch Material: Aluminum sheet, 0.090 inch (2.28 mm) thick.
 - 1. Finish: Mill Finish (Aluminum) with powdercoat finish.
 - 2. Color: As selected by Architect from manufacturer's full range.

F. Construction:

- 1. Curb and Cover Insulation: Polyisocyanurate insulation board, 3" thick with an R-value of 20.3 (U=0.049) with an 18 gauge aluminum liner.
- 2. Cover: Thermally broken, insulated, and double walled, with 11 gauge aluminum liner of same finish as outer metal lid. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior providing a continuous seal with the top of the curb.
- 3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb. The curb shall be formed with a 5 1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral 11 gauge aluminum cap flashing with fully welded corners and stamped tab clip flashing system spaced 6 inches on center for securing roof membrane. Bil-Clip Flashing System.
- 4. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile. Coordinate with Metal Roofing Supplier and Hatch location(s) accordingly.
- 5. Fabricate 11 gauge aluminum curbs with thermally broken interior and exterior surfaces to a minimum height of 12 inches unless otherwise indicated.
- 6. Lifting Mechanism: Compression spring operators enclosed in telescopic tubes controlling the operation of the Cover throughout the entire movement of the cover. Tubes shall be located to prevent accumulation of moisture, dirt and debris. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.
- G. Hardware: Heavy stainless-steel spring latch with interior and exterior turn handles, pintle-type hinge system, and interior and exterior padlock hasps.
 - 1. The latch strike(s) shall be a stamped component bolted to the curb assembly.
 - 2. Provide two-point latch on lids larger than 84 inches.
 - 3. The cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1 inch diameter red vinyl grip handle to permit the easy release for closing.
 - 4. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be Type 316 stainless steel.
 - 5. Cover hardware shall be bolted into the heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
- H. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
 - 1. Height: 42 inches above finished roof deck.
 - 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 - 3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
 - 4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 - 5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - 6. Post and Rail tops and ends: Weather resistant, closed or plugged with prefabricated end fittings.
 - 7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 - 8. Fabricate joints exposed to weather to be watertight.
 - 9. Fasteners: Manufacturer's standard, finished to match railing system.
 - 10. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.
- I. Ladder-Up Safety Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

- 1. Operation: High-Strength Steel Post locks in place on full extension, Post Pull-up loop provided at the top of the Post to assist in raising the Post.; release mechanism returns post to closed position. Post shall have controlled upward and downward movement.
- 2. Height: 42 inches above finished roof deck.
- 3. Material: Steel tube.
- 4. All Hardware: Type 316 Stainless Steel.
- 5. Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.
- 6. Post: 1-5/8 inch diameter pipe.
- 7. Manufacturer: The Bilco Company (1-800-366-6530) or Architect approved equivalent.
- 8. Model: LU-1 (Steel Yellow Powder Coat).

2.06 PIPE SUPPORTS

- A. Pipe Supports: Adjustable-height, extruded-aluminum tube, filled with urethane insulation; 2 inches in diameter; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, and extruded-aluminum carrier assemblies; suitable for quantity of pipe runs and sizes.
 - 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. DURA-BLOK
 - b. MIRO Industries, Inc.
 - c. Architect approved equivalent.
 - 2. Pipe Support Height: As indicated on Drawings.
 - 3. Roller Assembly: With stainless-steel roller, sized for supported pipes.
 - 4. Pipe Support Flashing: Manufacturer's standard insulated sleeve flashing with integral base flange; aluminum sheet, 0.063 inch (1.60 mm) thick.
 - 5. Finish: Manufacturer's standard.

2.07 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and slotted metal collar.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Custom Solution Roof and Metal Products
 - b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc
 - 2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
 - 3. Diameter: As indicated.
 - 4. Finish: Manufacturer's standard.
- B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 - 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. Custom Solution Roof and Metal Products
 - b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc
 - 3. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
 - 4. Height: 18 inches (457.2 mm).
 - 5. Diameter: As indicated.
 - 6. Finish: As selected by the Architect from the manufacturer's full line of finishes.

2.08 ROOF TOP ANCHORAGE CONNECTION SYSTEM

- A. Roof Anchorage Connection System:
 - 1. 3M DBI-SALA Engineered System or approved equal.
 - a. For use on roofs up to 3:12 pitch.
 - b. Weather shroud protected.
 - c. 5,000 load capacity or 2:1 safety factor for each connected load.
 - d. Swiveling tie-off point
 - e. Model: 2100139 (for membrane type roofs).
 - f. Maximum arresting force: 310 pounds.
 - g. Attachment Method: As recommended by manufacturer to achieve respective OSHA and ANSI Z359.1 compliance requirements.

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. 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, 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.

3.02 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 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. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Roof-Hatch Installation:
 - 1. Install roof hatch so top surface of hatch curb is level.
 - 2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 3. Attach safety railing system to roof-hatch curb.
 - 4. Attach ladder-assist post according to manufacturer's written instructions.
- F. Pipe Support Installation: Install pipe supports so top surfaces are in contact with and provide equally distributed support along length of supported item.
- G. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.
- H. Seal joints with butyl sealant as required by roof accessory manufacturer.

3.03 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

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. Silicone joint sealants.
 - 2. Polyurethane joint sealants.
 - 3. Latex joint sealants.
 - 4. Preformed joint sealants.
 - 5. Acoustical joint sealants.

1.03 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Samples for Verification: For each type of sealant submit a color sample board and one sample joint, 1/2" wide by 6" long including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 ACTION SUBMITTALS

- A. See Section 013300 SUBMITTALS, for Submittal Procedures.
- B. Product Data: For each joint-sealant product indicated.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

- D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project with a minimum of three-years experience in the installation of the work of this section.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.07 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

- 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
- 2. Disintegration of joint substrates from natural causes exceeding design specifications.
- 3. Mechanical damage caused by individuals, tools, or other outside agents.
- 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants:
 250 g/L.

 2. Sealant Drimere for Nannersus Substrates:
 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full color range.
- G. Sealant Abbreviations:
 - 1. Use NT = Non-Traffic
 - 2. Use T = Traffic
 - 3. LM = Low Modulus
 - 4. Type S = Single Component
 - 5. Type M = Multi-component
 - 6. Grade NS = Non-Sag
 - 7. Grade P = Pourable
 - 8. Grade SL = Self-Leveling
 - 9. Use (related to Material)
 - 10. Use \dot{M} = Mortar Contact
 - 11. Use G = Glass Contact
 - 12. Use A = Aluminum Contact
 - 13. Use O = Other Materials

2.02 SILICONE JOINT SEALANTS

- A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
 - 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. Dow Corning Corporation; DOWSIL 790.
 - b. GE Advanced Materials Silicones; SCS2000 SilPruf LM.
 - c. Pecora Corporation; 301 NS
 - d. Sika Corporation, Construction Products Division; SikaSil-WS 290
 - e. Tremco Incorporated; Spectrem 1.
- B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Pecora Corporation; 311 NS.
 - b. Sika Corporation, Construction Products Division; SilkaSil-728 NS.
 - c. Tremco Incorporated; Spectrem 800.
- C. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 890-SL.
 - b. Pecora Corporation; 310 SL.
 - c. Sika Corporation, Construction Products Division; SilkaSil-728 SL.
 - d. Tremco Incorporated; Spectrem 900 SL.
- D. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Tremco Incorporated: Tremsil 200.
 - b. Pecora Corporation; 898 NST.
 - c. GE Advanced Materials; SCS1700 Sanitary.

2.03 POLYURETHANE JOINT SEALANTS

- A. Single-Component, Non-sag, Polyurethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikaflex 15LM.
 - b. Pecora Corporation; Dynatrol I-XL.
 - c. Tremco Incorporated; Dymonic 100.
- B. Single-Component, Nonsag, Traffic-Grade, Polyurethane Joint Sealant: ASTM C920. Type S, Grade NS, Class 25, for Use T.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Masterseal NP1.
 - b. Sika Corporation, Construction Products Division; Sikaflex 1a.
 - c. Tremco Incorporated; Dymonic 100.
- C. Single-Component, Pourable, Traffic-Grade, Polyurethane Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.
 - 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. BASF Building Systems; MasterSeal SL 1.
- b. Pecora Corporation; Urexpan NR-201.
- c. Sherwin-Williams Company, Loxon SL1 Self-Leveling.
- d. Sika Corporation. Construction Products Division; Sikaflex 1CSL.
- e. Tremco Incorporated; Vulkem 45 SSL.
- D. Immersible Multicomponent, Nonsag, Traffic-Grade, Polyurethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Uses T and I.
 - 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. Sika Corporation, Construction Products Division, Sikaflex 2c NS EZ
 - b. BASF Building Systems; MasterSeal NP 2.
 - c. Pecora Corporation; Dynatred.
 - d. Tremco Incorporated; Dymeric 240 FC.

2.04 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 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. BASF Building Systems; MasterSeal NP 520.
 - b. GE Advanced Materials; Ultra Seal.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.
 - e. Sherwin Williams Company (SherMax Urethanized Elastomeric Sealant).

2.05 PREFORMED JOINT SEALANTS

- A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from Polyurethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Tremco Incorporated; Spectrum SimpleSeal.
 - b. Tremco Incorporated; Illmod 600
 - c. Emseal Joint Systems, Ltd.; 25V.
 - d. Schul International Company; Sealtite Standard.

2.06 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining 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. Pecora Corporation; AC-20 FTR.
 - b. Sherwin-Williams Company, Sher-Max Urethanized Elastomeric Sealant
 - c. Tremco Incorporated; Tremflex 834, Acoustical/Curtain Wall Sealant
 - d. USG Corporation; SHEETROCK Acoustical Sealant.

2.07 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material 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. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.08 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- 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 joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, 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 after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.

- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer 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.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations and at perimeters of acoustical Panel edge channels of Acoustical Panel Ceiling systems. 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.

3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 1 test for each 500 feet of joint length thereafter or 1 test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 - 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints in paver and pavement installations.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Tile control and expansion joints.
 - 2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
 - 3. Polyurethane Joint Sealant: Single component, non-sag, traffic grade Single component, pourable, traffic grade.
 - 4. Preformed Joint Sealant: Preformed foam sealant.
 - 5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
 - 1. Joint Locations:
 - a. Joints in pedestrian plazas.
 - 2. Polyurethane Joint Sealant: Immersible, multicomponent, non-sag, traffic grade.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints in dimension stone cladding.
 - d. Joints between metal panels.
 - e. Joints between different materials listed above.
 - f. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - g. Control and expansion joints in ceilings and other overhead surfaces.
 - 2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
 - 3. Polyurethane Joint Sealant: Single component, non-sag, Class 100/50.
 - 4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - 2. Polyurethane Joint Sealant: Single component, non-sag, traffic grade.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Locations:
 - a. Perimeter joints of exterior openings where indicated.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - 2. Joint Sealant: Latex Acrylic based.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Location:

- b. Tile control and expansion joints where indicated.
- 2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Location:
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 - 2. Joint Sealant: Acoustical joint sealant.

3.08 SEALANT INSTALLATION LOG

- A. A tabular log of all sealant installations on the project shall be be keep and submitted with the O & M manuals at the completion of the project.
- B. Tabular log shall have columns for:
 - 1. Sealant type
 - 2. Sealant installation location
 - 3. Temperature during installation
 - 4. Date of Installation
 - 5. Manufacturer
 - 6. Sealant color installed.

END OF SECTION

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 hollow-metal doors, fixed panels and frames.

1.03 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.04 COORDINATION

A. Coordinate anchorage installation 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.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.06 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Karpen Steel Custom Doors & Frames.
 - 4. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.02 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.03 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy-Duty Doors and Frames: SDI A250.8 Level 3. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level B according to ANSI/SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1 3/4 inches.
 - c. Face: cold-rolled steel sheet, minimum thickness of 0.053 inch (16 gauge) (Level 3).
 - d. Edge Construction: Model 2, Seamless.
 - e. Core Materials: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge) (Level 3).
 - b. Construction: Full Profile Weld Type.
 - 4. Exposed Finish: Prime.

2.04 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy-Duty Doors and Frames: SDI A250.8 Level 3. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1 3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge) (Level 3), with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core Materials:
 - Thermal-Rated Doors: Provide doors fabricated with a thermal-resistance value (R-value) of not less than R-10 when tested according to ASTM C1363. Provide Polyisocyanurate insulation.
 - 2) Provide Proprietary Bullet-resistant Core for doors noted as Security Doors on the drawings.
 - (a) Manufacturer: Total Security Solutions or approved equal.
 - (b) Security Level: Level 3 in accordance with UL 752.
 - (c) Hinges: Continuous Geared Hinge provided from factory.
 - 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (14 gauge) (Level 4), with minimum A60 (ZF120) coating.
 - b. Construction: Full Profile Weld Type.
 - 4. Exposed Finish: Prime.

2.05 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.06 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- C. Frame Anchors: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

- 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153/A153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143/C143M.
- F. Glazing: Comply with requirements in Section 088000 GLAZING
- G. Bituminous 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.

2.07 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

- 1) Two anchors per jamb up to 60 inches high.
- 2) Three anchors per jamb from 60 to 90 inches high.
- 3) Four anchors per jamb from 90 to 120 inches high.
- 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
- c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- 8. Terminated Stops: Terminate stops 6 inches above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in ANSI/SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Frame Moldings: Provide beveled stops and frame moldings around glazed lites and louvers where indicated. Form corners of interior stops and moldings with mitered hairline joints. Exterior frame moldings shall be welded and ground smooth prior to priming.
 - 1. Single Glazed Lites: Provide beveled fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide beveled fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide beveled fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Frame profiles shall be beveled unless indicated otherwise on the drawings.
 - 5. Provide beveled loose stops and moldings on inside of hollow-metal work.
 - 6. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.08 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.09 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

- 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
- 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
- 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
- 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 GLAZING and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

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-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
 - 4. Louvers installed in flush wood doors.
 - 5. Light frames and glazing installed in wood doors.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
 - 7. Fire-protection ratings for fire-rated doors.
- C. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
 - 2. Louver blade and frame sections, 6 inches long, for each material and finish specified.
 - 3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.04 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

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. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- C. Fire Rated Wood Doors: Doors 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 at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.

- 1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.
- Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.
- D. Smoke Control Door Assemblies: Comply with NFPA 105.
 - 1. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.07 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.08 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42 by 84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.
 - 4. Warranty Period for Hollow-Core Interior Doors: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. VT Industries, Inc.; Heritage Series
 - 2. Masonite Architectural.
 - 3. Or approved equal.

- B. Source Limitations: Obtain flush wood doors indicated to be blueprint matched with paneling from single manufacturer.
- 2.02 FLUSH WOOD DOORS, GENERAL
 - A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards WDMA I.S. 1A, "Architectural Wood Flush Doors."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
 - B. ICC A117.1 Accessible and Usable Buildings and Facilities.
 - C. WDMA I.S. 1A Performance Grade: Heavy Duty and Extra Heavy Duty as specified.
 - D. WDMA I.S. 1A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
 - 2. Extra Heavy Duty: public toilets, janitor's closets and assembly spaces.
 - 3. Standard Duty: Closets (not including janitor's closets).
 - E. Fire-Rated Wood Doors: Doors 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.
 - 1. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
 - 2. Cores: Provide stave lumber core or mineral core as needed to provide fire-protection and positive pressure rating indicated.
 - 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - 4. Electronic Barcode: "VTsmartdoor" barcode technology.
 - a. Location: Fire label, hinge stile of doors.
 - b. Provide fire-rated door assembly information required for Owner's annual fire-door inspection in accordance with NFPA 820, Paragraph 5.2.1.
 - F. Mineral-Core Doors:
 - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 - 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 - a. 5-inch top-rail blocking (HB-1).
 - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates (HB-2).
 - c. 5-inch midrail blocking, in doors indicated to have armor plates (HB-6).
 - d. 5-inch midrail blocking, in doors indicated to have exit devices (HB-6).
 - 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges (HB-7).
 - a. Screw-Holding Capability: 550 lbf per WDMA TM-10.

2.03 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Premium with Grade A faces.
 - 2. Species: White Oak.
 - 3. Cut: Rift Cut.
 - 4. Match between Veneer Leaves: Book match.
 - 5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - 6. Pair and Set Match: Provide for doors hung in same opening.
 - 7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 - 8. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 064216 "Flush Wood Paneling."
 - 9. Exposed Vertical and Top Edges: Same species as faces edge Type A.
 - 10. Core: Either glued wood stave lumber core or structural composite lumber.
 - 11. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
 - 12. WDMA I.S. 1A Performance Grade: Extra Heavy Duty.

2.04 LIGHT FRAMES AND LOUVERS

- A. Metal Vision Light Frames for Fire Rated Doors: 18 and 20 gauge cold rolled steel, Custom Color Baked Enamel finish, Type M4 as per WDMA I.S. 1A as manufactured by one of the following:
 - 1. Anemostat Door Products; LoPro Metal Vision Frames for 1/4" or 5/16" glazing and LoPro-STC Sound Rated Metal Vision Frame..
 - 2. or approved equal.
- B. Metal Louvers: Roll formed galvanized steel with overlapping frame; finish same as door components; factory-installed.
 - 1. Non-fire-rated Louvers: Roll-formed galvanized steel with overlapping frame; factory-installed.
 - a. Style: Sightproof inverted Y blade
 - b. Louver Free Area: 50% percent.
 - c. Finish: factory finish as selected by the Architect from the manufacturer's full color offering.
 - d. Fasteners: Exposed, tamper proof fasteners.
 - e. Manufacturer:
 - 1) Rockwood LV-IY.
 - 2) <u>Air Louvers, Inc</u>
 - 3) Anemostat; a Mestek company
 - 4) Architect approved equivalent.
 - f. Substitutions: See Section 016100 Product Requirements and Section 012500 Substitution Procedures.

2.05 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with NFPA 80 requirements for fire-rated doors.

- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA A156.115W, and hardware templates.
 - 1. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 GLAZING.
 - 3. Louvers: Factory install louvers in prepared openings.

2.06 FINISHES -WOOD VENEER DOORS

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 10. UV Curable, Water Based.
 - 3. Finish: WDMA TR-6/OP-6 (Extra Heavy-Duty) catalyzed polyurethane and TR-8, UV cured urethane (Premium Grade).
 - 4. Staining: As selected by Architect from manufacturer's full range.
 - 5. Sealer: minimum 3 coats.
 - 6. Sanding: Sand.
 - 7. Topcoat: 2 coats.
 - 8. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores or as selected by the architect.
 - 9. Sheen: Semi-gloss.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: See Section 087100 DOOR HARDWARE.
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
- C. 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 edges of doors, edges of cutouts, and mortises 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 unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

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. Access doors and frames for walls and ceilings.

1.03 REFERENCES

- A. ASTM E 152 Standard Methods of Fire Tests of Door Assemblies
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2019.
- D. 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).
- E. 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).
- F. NFPA 80 Standard for Fire Doors and Other Opening Protectives; 2022.

1.04 SUBMITTALS

- A. Section 013300 SUBMITTALS: Procedure for submittals.
- B. Shop drawings: Fully describe and locate all items being furnished and include large scale details of principal construction features and internal reinforcement. Indicate dimensions, elevations, hardware, reinforcement, anchor types and spacing, and finishes.
- C. Product Data: Indicate door and frame configuration and finishes with manufacturer's standard details and catalog data demonstrating compliance with referenced standards
- D. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
- E. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Minimum five years documented experience producing products specified in this section.
- B. Installer: Minimum five years documented experience installing products specified in this section.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Airtight/ Watertight Access Doors and Frames: Units shall be tested in accordance with the following ASTM Test Methods and found to comply with the test requirements with written certifications provided to the Architect.
 - 1. Air Infiltration: Less than 0.01 cfm/sq. ft. as tested in accordance with ASTM E283.
 - 2. Water Penetration: no leakage at 15.05 psf as tested in accordance with ASTM E331.

2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
 - 1. Acudor Products, Inc.
 - 2. Best Access Doors.
 - 3. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 - 4. Karp Associates, Inc.
 - 5. Milcor Inc.
 - 6. Nystrom, Inc.
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Concealed Flanges:
 - 1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
 - 2. Locations: Wall and ceiling .
 - 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage a. Finish: Factory prime.
- D. Hardware:
 - 1. Latch: Self-latching bolt operated by flush key with interior release or as indicated for each door.
- E. Locks:
 - 1. Cylinder locks keyed alike for each door panel. Provide 2 keys per access panel. Coordinate locks and keying with the Owner's requirements and existing keying system(s) where applicable.

2.03 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Stainless Steel: Type 304, brushed #4 finish.
- C. Frame Anchors: Same type as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F 2329. At stainless steel doors, provide stainless steel fasteners.

2.04 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

- B. Metal Surfaces: For metal surfaces 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.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 3. Provide mounting holes in frame for attachment of masonry anchors.

2.05 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" 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: 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.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates 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 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Verify that field measurements, surfaces, substrates and project conditions are as required and suitable for installation. Verify that rough openings for door and frame are correctly sized and located. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.
- D. Secure rigidly in place.
- E. Position unit to provide convenient access to concealed work requiring access.

3.03 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

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:
 - 1. This section includes Four-Fold metal doors with surface mounted tube frames.
 - 2. Operation of Four-Fold metal doors includes overhead mounted electro-mechanical operators, control switches, safety devices, transmitters and remote switches.
 - 3. Loop detectors encased in exterior concrete aprons at each Four-Fold Door location.
 - 4. Activation and Deactivation of Apparatus Bay heating and exhaust systems.
 - 5. Provide additional safety features including warning horn, strobe light, and Red/Green LED light.
- B. Related Sections include but are not limited to:
 - 1. Section 033000 Cast-In-Place Concrete.
 - 2. Section 055000 Metal Fabrications.
 - 3. Division 26 Electrical

1.03 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements.
- C. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements. Include product data and installation instructions for all associated controls and safeties including but not limited to photo eyes, presence sensors, safety edges, loop detectors, and radio controls. Provide product data and installation installation instructions for the following accessories to be furnished and installed:
 - 1. Horn
 - 2. Strobe Light
 - 3. Red/Green traffic style LED light.
- D. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of work.
- E. Wiring diagrams for coordination with electrical trade, Four-Fold Door safety devices, Four-Fold Door operating devices, Deactivation and reactivation of other building systems.
- F. Shop Drawings: Include plans, elevations, sections, details, attachment to other work and analysis data 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 Four-Fold Doors indicate compliance with design wind and seismic loads, include structural and seismic analysis data signed and sealed by the qualified professional engineer, licensed in the State in which the project is located, who is responsible for their preparation.

- G. Color Selection: 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 selected by the Architect for final color approval.
- H. Door Installer: Submit qualifications of Door Installer.
- I. Warranty: Submit sample warranties as detailed in Paragraph 1.06.
- J. Closeout Submittals:
 - 1. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in operating and maintaining all doors under this section. Include manufacturer's brochures and parts lists describing the actual materials used in the product. Include all accessory items.
 - 2. Continuing Maintenance Proposal: Submit directly to Owner with a copy to the Architect.

1.04 QUALITY ASSURANCE

- A. Door manufacturer shall have at least 10 years' experience in manufacturing door type specified for emergency vehicle applications. Door shall be designed and manufactured in North America.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer for both installation and maintenance of Four-Fold Doors required for this Project.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and to permit access for inspection and handling.
- B. Handle materials carefully to prevent damage.

1.06 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of folding doors and accessories that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, bout not limited to. Excessive deflection.
 - b. Failure of components or operators before reaching required number of operation cycles.
 - c. Faulty operation of hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
 - e. Delamination of exterior or interior facing materials.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion, 10 years from date of Substantial Completion for Kynar finished components.
- C. Special Delamination Warranty: Manufacturer agrees to repair or replace components that show evidence of delamination of polyurethane foam from steel face.
- D. Maintenance Service During Warranty Period: Emergency call-back service (24/7) when door operation is affected. Routine and preventative maintenance during normal business hours.

E. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from installer to Owner, in the form of standard five-year maintenance agreement, starting when the 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 proposal and may negotiate all aspects of the proposal.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Four-fold industrial metal doors manufactured by Door Engineering and Manufacturing, 400 Cherry Street, Kasota, MN 56050, (800) 959-1352 or equal products by other manufacturers approved in advance.
 - 1. Series: FF300 Series: Glazed (Basis of Design)

2.02 MATERIALS

- A. Steel Tube: ASTM A513 and ASTM A500/A500M.
- B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011/A1011M hot-rolled steel sheet.
- C. Hardware: Manufacturer's standard components.
- D. Fasteners: Zinc-coated steel.

2.03 PERFORMANCE REQUIREMENTS

- A. Doors shall be designed to withstand external or internal horizontal wind loads of 25 pounds minimum per square foot. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 psi. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual".
 - 1. Testing: According to ASTM E 330 or DASM 108 for garage doors and meeting the acceptance criteria of DASMA 108.
 - 2. Deflection Limits: Design folding garage doors to withstand design wind load without evidencing permanent deformation or disengagement or door components.
 - 3. Operability under Wind Load: Design folding apparatus bay doors to remain operable under design wind load, acting inward and outward.
- B. Seismic Performance, Exterior Doors and their operating components: Shall be designed to meet the seismic requirements indicated on the Structural Drawings.

2.04 FOUR-FOLD DOORS

- A. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8" in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.
- B. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x0.25, designed to anchor masonry wall construction or weld to steel structure. All hinges, track supports, and operator supports shall be factory attached.

- C. Factory finish: All exposed steel shall be finished with manufacturer's standard epoxy primer and polyurethane top coat. Customer to select from manufacturer's standard RAL color chart.
- D. Operating Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pair of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation. Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinges pins shall be minimum ³/₄" diameter hardened steel.
- E. Hinge Guards: Provide plastic guards at jamb hinges to prevent access through hinge space.
- F. Weather-stripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weather-stripping at center shall be 1/16" cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weather-stripping at sill shall include two 1/16" cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.
- G. Perimeter Weather-stripping: Provide jamb and head weather-stripping of 1/16" cloth-inserted neoprene bulb (or closed cell neoprene).
- H. Vision Panels: Provide 1" insulated tinted vision panels of the size, shape and location as noted in the drawings. Glazing to be tempered safety glass, Sungate 500 low E.

2.05 OPERATOR

- A. Each four-fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operation consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.
- B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position.
- C. Operator shall be equipped with disengaging mechanism to convert to free-wheeling mode for manual operation.
 - 1. Set Screw Type
 - 2. Emergency Disconnect Handle Type
 - 3. Floor Level Disconnect Type
- D. Operator shall include a formed hood enclosing the motor, gearboxes and limit switches.
- E. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for single phase 120 VAC, 60 Hertz operation.
- F. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door and built in accordance with the latest NEMA standards. Incoming electric shall be 110-120VAC Single Phase.
 - 1. Control panel assemblies shall be UL listed as per NFPA 70.
 - 2. Control panel shall be Narrow style "CW" Control Panel.

- 3. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.
 - a. Provide auxiliary contacts to turn off and turn back on infrared heaters, general exhaust system, and one spare set of contacts for a future system needing activation/deactivation with door movement.
- 4. Controls shall include a variable frequency drive with independent adjustment of the opening and closing speeds.
- 5. Motor starters shall be magnetic reversing, factory wired with overload and under voltage protection, and equipped with mechanical interlocks. All control components shall be enclosed in one enclosure with a wiring diagram placed on the inside cover.
- 6. If incoming voltage is single phase, control panel shall include a variable frequency drive to convert voltage to 3-phase for the motor.
- 7. If enclosure is remotely located from Four-Fold Door, provide surface mounted name plate identifying Four-Fold Door.
- 8. Enclosures shall be NEMA 4 with lockable disconnect switch.
- 9. Pushbuttons (interior at door) for each door shall have one (1) momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4. See drawings for location of door controls (push buttons).
- 10. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
- 11. Safety edges: Provide 4-wire Fail-Safe electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
- 12. Photo eyes: Provide one (1) exterior, jamb mounted, light curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72" above floor.
- 13. Presence Sensor: Provide one (1) interior, overhead mounted, presence sensor with pre-open and pre-close safety fields. Sensor shall be LZR-Widescan or equal to.
- 14. Radio controls: Provide one (1) radio receiver and one (1) single button remote per door. Remotes to open and close doors with single button.
- 15. Timer Activation Loop Detectors: Provide "pulse on exit type" loop detector to activate auto close timer once loop has been activated and cleared, include hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to exterior apron being poured. Provide conduit encased in apron concrete from loop detector to Four-Fold Door controller. Route conduit within CMU back-up wall.
- 16. Warning Horn/Strobe Light: Provide weatherproof warning horn and weatherproof strobe LED light. Include outputs PLC to allow for activation while door is in motion both opening and closing, along with activating the warning horn for a set time, prior to the door closing.
- 17. Red/Greene Traffic Light: Provide weatherproof Red/Green traffic style LED light for each Four-Fold Door. Light shall be solid red when door is closed. Light shall flash red when Four-Fold Door is opening or closing. Light shall turn solid Green when Four-Fold Door reaches fully open position. Light shall be mounted on an extension arm off the apparatus bay wall on the Driver's side of the apparatus. Light shall extend from the wall and be mounted on an angle to be clearly visible from the apparatus driver's seat position when Four-Fold Doors are in the open position. Bottom of light to be mounted at 7' 6" AFF.
- 18. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

2.06 METAL FINISHES

- A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes.
- B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated

C. Color and Gloss: Gloss (Kynar 500) – as selected by Architect from the full line of RAL color numbers

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install four-fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.
- B. Doors shall be set plumb, level and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.02 ADJUSTING AND CLEANING

- A. Adjust Four-Fold Doors and seals to provide weather-resistant fit around entire perimeter.
- B. Inspection of the doors and a complete operating test will be made by the installer in the presence of the CM, Owner, General Contractor and Architect when:
 - 1. The installation of all Four-Fold Doors is complete.

with coating and resin manufacturers' written instructions.

- 2. Doors are connected to permanent power
- 3. Systems that Four-Fold Doors are connected to i.e. apparatus bay heating units, apparatus bay exhaust system, loop detectors, etc., are fully operational.
- 4. All safety systems are connected and operational.
- 5. Each Four-Fold Door shall be tested including all its safety features and operation of other building systems, a minimum of three (3) successful times. Tests of an individual door shall be separated by one (1) hour minimum. Tests that detect a deficiency of any type shall not be counted towards the three (3) required tests. The CM shall prepare a written check list indicating each function to be verified during the test. Installer, CM and Owner shall sign test reports for each Four-Fold Door.
- C. Clean surfaces and repaint abrade or damaged finished surfaces to match factory-applied finish.
- D. The Four-Fold Door Installer shall re-adjust doors after installation of epoxy flooring and/or any other floor coating that effects the proper operation of the Four-Fold Doors.
- E. Within seven (7) days prior to Substantial Completion, the Installer shall return and repeat one (1) complete operation test on each Four-Fold Door in the presence of the CM and Owner.

3.03 DEMONSTRATION

- A. Engage a factory authorized representative to train Owner's maintenance personnel to adjust, operate and maintain Four-Fold Doors, including all accessory functions.
- B. Factory Authorized Representative shall review Operation and Maintenance Manuals with Owner's maintenance personnel.

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.
- 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 push buttons, accessories, and/or other remote operator locations are the responsibility of the Electrical Contractor.
- C. 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 016100 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 all accessories.
- E. Shop Drawings:
 - 1. 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. 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 devices.
 - d. Deactivation and reactivation of other building systems.
- F. 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.
- 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 paint finish.
- I. 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.
- J. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner in the form of a 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 operators 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 date of Substantial Completion. Commercial Operator shall be warranted for three (3) years from date of Substantial Completion.

H2M

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Raynor, which is located at: 1101 East River Rd. P. O. Box 448; Dixon, IL 61021-0448; Toll Free Tel: 800-4-RAYNOR; Tel: 815-288-1431; Fax: 888-598-4790; Email: architectsupport@raynor.com; Web: <u>www.raynor.com</u>
- B. Substitutions: Architect approved equal
- C. Requests for substitutions will be considered in accordance with provisions of Section 016100.

2.02 SECTIONAL RAIL AND STYLE ALUMINUM DOORS

- A. AlumaView as manufactured by Raynor Garage Doors:
 - 1. Doors:
 - a. Operation:
 - 1) Provide doors designed for electric motor operation.
 - b. Jamb Construction:
 - 1) Masonry jambs with anchor bolt fasteners.
 - c. Structural Performance Requirements:
 - 1) Wind Loads: 13.3 psf design load/ 20 psf test load standard (AV300)
 - d. International Energy Conservation Code (IECC) Requirements:
 - 1) Air Infiltration: Maximum air leakage of 0.4 cfm/ft2 is required. Testing shall be performed in accordance with DASMA 105 test procedure.
 - 2) Raynor AV300 provides an air leakage rating of 0.24 cfm/ft2 with optional IECC Compliance Package.
 - 2. Sections:
 - a. AlumaView AV300:
 - Material: 3 inches (76 mm) thick, 6063-T6 aluminum alloy stiles and rails joined together with 5/16 inch (8 mm) diameter screws. Aluminum panels 0.050 inch (1.3 mm) thick or glazing (when specified) fill the spaces between stiles and rails. Combined dimension of two adjoining intermediate meeting rails 5-1/2 inches (140 mm). Bottom rail height 6-1/2 inches (165 mm). Top rail height 6-1/2 inches (165 mm). End stiles 3-5/16 inches (89 mm) or 6-1/2 inches (165 mm) wide as determined by overall door width. Center stiles 3-5/8 inches (92 mm) wide.
 - 2) Finish: Aluminum frame extrusions and filler panels finish coated.
 - (a) ArmorBrite Powdercoatfinish, color as selected by architect.
 - (1) RAL 3013 Tomato Red
 - 3. Seals: Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail.
 - a. Bulb-type joint seal between sections.
 - b. Blade seal on top section to prevent airflow above header.
 - c. Trussing: Doors designed to withstand specified windload. Deflection of door in horizontal position to be maximum of 1/120th of door width.
 - 4. Windows: Provide door sections with windows in lieu of 0.050 inch (1.3 mm) aluminum filler panels. Locations to comply with door elevation drawings.
 - 5. Non-Impact Rated Glazing: Provide as follows:
 - a. 1 inch insulated glazing options (AV300)
 - 1) 1 inch (25.4 mm) Insulated Low E Tempered Glass consisting of two panes of 1/8 inch (3.2 mm) Tempered insulated glass.
 - 6. Track:
 - a. Material: Hot-dipped galvanized steel (ASTM A 653), fully adjustable for adequate sealing of door to jamb or weatherseal.
 - b. Configuration Type: Normal Headroom.

- c. Track Size: 3 inches (76 mm).
 - 1) Jamb Type: Steel, wood, or masonry.
 - (a) Mounting: Floor-to-header angles. 13 gauge (2.2 mm) minimum continuous angles from floor to door header. Angle Size: 3-1/2 x 5 inches (89 x 127 mm) on 3-inch track.
- d. Finish:
 - 1) Galvanized.
- e. Counterbalance:
 - Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.
 - (a) Spring Cycle Requirements: High cycle: 50,000 cycles.
- f. Hardware:
 - 1) Hinges and Brackets: Fabricated from galvanized steel.
 - 2) Track Rollers: 3 inches (76.2 mm) diameter consistent with track size, with hardened steel ball bearings.
 - 3) Perimeter Seal: Provide complete weather stripping system to reduce air infiltration. Weather stripping shall be replaceable.
 - (a) For angle mounted doors provide angle clip-on seal.
- 7. 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.

2.03 ELECTRIC OPERATORS:

- A. Operator shall be Raynor Control Hoist Optima, NEMA 4, 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.
- B. Motor; provide continuous duty motor. Motor shall be separate from reduction mechanism for ease of maintenance.
- C. 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.
- D. Roller Chain Drive door shall be driven by roller chain at 6" to 12" per second.
- E. Adjustable Friction Clutch shall be provided to protect door and operator if door movement is obstructed.
- F. Starter Reversing Contactor type (Type RGJH). Furnish heavy duty across the line reversing type with mechanical interlock.
- G. 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.
- H. Provide auxiliary output module with the capability to integrate with other devices including:
 - 1. Dry relay contacts at door limit positions.
 - 2. Lamp output contacts.

- 3. Selectable ADA outputs to sound a horn, operate a red/green light, and/or operate a door safety light system.
- 4. Multiple relay contact points.
- I. Provide Model #300320 RC Operator Pushbuttons Flush Mounted.
- J. 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 Radio Room to operate each individual overhead door. provide Model #300320 RC Operator Pushbuttons Flush Mounted in the Radio Room. 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 Radio Room. 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 bezel 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 4 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.

K. 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 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

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. Exterior and Interior storefront framing.
 - 2. Exterior and Interior manual-swing entrance doors and door-frame units.

1.03 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads:
 - a. Basic Wind Speed: 128 mph.
 - b. Importance Factor: IV
 - c. Exposure Category: B
 - 2. Seismic Loads: As indicated on Drawings.
- D. Deflection of Framing Members:
 - 1. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E330/E330M as follows:
 - 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

- 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
- 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. A pair of 6'-0" x 7-'0" entrance doors and frame shall not exceed 1.0 cfm per square foot. A single 3'-0" x 7'-0" entrance door and frame shall not exceed 1.0 cfm/ft2.
- G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
 - 1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- I. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. 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.
 - 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - 3. Interior Ambient-Air Temperature: 75 deg F.
- J. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 77 frame and 71 glass (Low E) when tested according to AAMA 1503.
- K. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having a system U-factor of not more than 0.38 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.
- L. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
 - 1. Sound Transmission Class (STC): Minimum 36 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
 - 2. Outdoor-Indoor Transmission Class (OITC): Minimum 30 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.
- M. Material Ingredient Reporting: Shall have a complete list of chemical ingredients to at least 100ppm (0.01%) that covers 100% of the product, acceptable documentation includes:

- 1. Manufacturer's inventory with Chemical Abstract Service Registration Number (CASRN or CAS#).
 - a. Kawneer's Material Transparency Summary (MTS).
- Cradle to Cradle certification: Either document below is acceptable for this option.
 a. Cradle to Cradle Certified[™] with Material Health section Silver or above.
 - b. Silver level or above Material Health Certificate.
- 3. Red List Free DECLARE label.
- 4. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated.
- C. 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.
 - 1. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
 - a. Include field measurements of openings.
 - b. Include elevations showing:
 - 1) Appearance of Aluminum-framed system layouts.
 - 2) Locations and identification of manufacturer-supplied door hardware and fittings.
 - 3) Locations and sizes of cut-outs and drilled holes for other door hardware.
 - c. Include details of:
 - 1) Requirements for support and bracing at openings.
 - 2) Installation details.
 - 3) Appearance of manufacturer-supplied door hardware and fittings.
 - d. Schedule: Listing of each type component in Aluminum-framed system assemblies, cross-referenced to shop drawing plans, elevations, and details.
- D. 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 preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines ICC A117.1.
- F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2/D1.2M, "Structural Welding Code Aluminum."

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

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. Water leakage through fixed glazing and framing areas.
 - d. Failure of operating components.
 - 2. Warranty Period: Five Years (Class I Anodized) from date of Substantial Completion.
- B. Special Finish Warranty AAMA 2605 : 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 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
 - 1. 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 entrance door hardware.
 - 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 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: Trifab VersaGlaze 451 Framing System (Basis of Design)
 - a. System Dimensions: 2" x 4-1/2" nominal dimension
 - b. Glass: Front plane
 - c. Non-Thermal
 - d. Locations: Interior locations as indicated on contract drawings.
 - 2. Kawneer North America: Trifab VersaGlaze 451T Framing System (Basis of Design)
 - a. System Dimensions: 2" x 4-1/2" nominal dimension
 - b. Glass: Front plane
 - c. Thermal
 - d. Locations: Exterior locations as indicated on contract drawings.
 - 3. YKK AP America Inc.

- 4. EFCO Corporation.
- 5. TRACO.
- 6. or Architect Approved Equal

2.02 MATERIALS

- A. Aluminum: 6063-T6 Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
 - 4. Structural Profiles: ASTM B308/B308M.
 - 5. 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 A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- C. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- D. Recycled Content:
 - 1. Shall have a minimum of 50% mixed pre- and post-consumer recycled content.
 - 2. Indicate recycled content, including the percentage of pre- and post-consumer recycled content per unit of product.
 - 3. Indicate the relative dollar value of recycled content product to the total dollar value of product included in the project.
 - 4. Indicate the location for recovery of recycled content.
 - 5. Indicate the location of the manufacturing facility.
- E. Red List Free:
 - 1. All parts and materials comply with the Living Building Challenge/DECLARE Red List and the Cradle-to-Cradle (C2C) Banned List:
 - a. PVC-free
 - b. Neoprene-free
 - 2. Product does not contain PVC or Neoprene.

2.03 FRAMING SYSTEMS

- A. Aluminum Extrusions: ASTM B221, 6063-T6 alloy and temper or as recommended by aluminum-framed door and storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and door leaf members.
 - 1. Construction: Thermally broken.
 - a. Kawneer IsoLock® Thermal Break with dual nominal 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
 - b. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505

- 2. Glazing System: Retained mechanically with gaskets on four sides.
- 3. Glazing Plane: Multipane.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Where exposed, fasteners and accessories shall be stainless steel.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, non-bleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
 - 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.04 GLAZING SYSTEMS

- A. Glazing: As specified in Section 088000 GLAZING
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal, Extruded EPDM rubber.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape:
 - 1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
 - 1. Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
 - Structural Sealant: ASTM C1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
 a. Color: Black matching structural sealant.

2.05 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 2 1/4 inches (Insulclad 260, 360 and 560) 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: 500 Wide Stile; 5 inch vertical face dimension..
 - a. Top Rail: 5 inches (500).
 - b. Bottom Rail: 10 inches (optional)
 - 1) Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
- 3. Thermally Broken entrance Framing Kawneer IsoLock[™] Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
 - a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
- 4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops, 0.05 inch (1.3 mm) thick and preformed gaskets of EPDM elastomeric extrusions or a thermoplastic elastomer.
- 5. Provide adjustable glass jacks to help center the glass in the door opening.
- 6. Slide-In-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
 - a. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

2.06 ENTRANCE DOOR HARDWARE

- A. General: 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-framed entrance doors. Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section. Adjust hardware to accommodate security and access control applications accordingly.
 - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products. See Section 087100 DOOR HARDWARE for detail Hardware information.
 - 2. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- B. Opening-Force Requirements:
 - 1. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force of not more than 15 lbf for not more than 3 seconds.
 - 2. Latches and Exit Devices: Not more than 15 lbf required to release latch.
- C. Pivot Hinges: BHMA A156.4, Grade 1.
- D. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Cylinders: As specified in Section 087100 DOOR HARDWARE.
 - 1. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".
- F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

- G. Operating Trim: BHMA A156.6.
- H. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- I. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- J. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing with polymeric fin.
 - 2. Meeting stiles on pairs of doors shall be equipped with two lines of weather-stripping utilizing wool pile with polymeric fin.
 - 3. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing and a wool pile with polymeric fin.
- K. Weather Sweeps: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners
- L. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1v:2h, with maximum height of 1/2 inch. Thermally broken, with ribbed slip-resistant surface.
- M. Electric Strike / Strike Keeper: BHMA A156.31

2.07 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 - JOINT SEALANTS.

2.08 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate thermally broken aluminum-framed entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- C. Fabricate thermally broken aluminum-framed doors that are reglazable without dismantling perimeter framing.
- D. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered. Make joints hairline in appearance
 - 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 interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 8. Prepare components with internal reinforcement for door hardware.
- E. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

- 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 of 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. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.09 ALUMINUM FINISHES
 - A. Kawneer Permanodic[™] AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating. Color: Dark Bronze.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated installation.
 - 1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

3.03 INSTALLATION

A. General:

- 1. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing thermally broken aluminum-framed entrance doors, hardware, accessories, and other components.
- 2. Install thermally broken aluminum-framed entrance doors 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.
- 3. Do not install damaged components.
- 4. Fit joints to produce hairline joints free of burrs and distortion.
- 5. Rigidly secure non-movement joints.
- 6. Set sill threshold in bed of sealant, as indicated, for weather tight construction.
- 7. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
- 8. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing non-conductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 JOINT SEALANTS to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Section 088000 GLAZING.
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants as specified in Section 079200 JOINT SEALANTS to produce weathertight installation.

3.04 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.
- 3.05 FIELD QUALITY CONTROL
 - A. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive

phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

- Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm / sq. ft. of fixed wall area when tested according to ASTM E283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- 2. Water Infiltration: Conduct tests in accordance with ASTM E1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.
- B. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.07 CLEANING AND PROTECTION

- A. Clean aluminum surfaces immediately after installing aluminum-framed door and storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels, and clean surfaces.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

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 conventionally glazed aluminum curtain walls installed as assemblies.

1.03 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by preconstruction testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - a. Basic Wind Speed: 128 mph.
 - b. Importance Factor: IV.
 - c. Exposure Category: B.
 - 2. Blast Loads: As indicated on Drawings.
 - 3. Periodic Maintenance-Equipment Loads: As indicated on Drawings.
- D. Structural-Test Performance: Test according to ASTM E330/E330M as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
 - a. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller. Delete first subparagraph below if no operable windows or doors.

- b. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
- 2. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
- F. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. Component Resistance Factor: 1.5
- G. Story Drift: Accommodate design displacement of adjacent stories indicated.
 - 1. Design Displacement: As indicated on Drawings.
 - 2. Test Performance: Meeting criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
- H. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).
- I. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).
 - 1. Maximum Water Leakage: According to AAMA 501.1 No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.
- J. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - 2. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
 - 3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
- K. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.
 - 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than.24 (Summer Day) and 0.30 (Winter-Night) as determined according to NFRC 100.
 - 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
 - 3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. value of fixed wall area as determined according to ASTM E283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 - 4. Condensation Resistance Factor (CRF): Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than [] as determined according to AAMA 1503.
- L. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:
 - 1. Outdoor-Indoor Transmission Class: Minimum 30 when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.

2. Sound Transmission Class (STC): Minimum 37 when tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90.

1.04 PRE-CONSTRUCTION TESTING

- A. Preconstruction Testing Service: Provide glazed aluminum curtain walls that comply with test-performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing by a qualified testing agency.
 - 1. Owner will engage a qualified testing agency to perform preconstruction testing on laboratory mockups.
 - 2. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.
 - 3. Notify Architect five days in advance of the dates and times when laboratory mockups will be constructed.
 - 4. Preconstruction Testing Program: Perform tests specified in "Performance Requirements" Article on laboratory mockups in the following order:
 - a. Structural-performance preloading at 50 percent of the specified wind-load design pressure when tested according to ASTM E330/E330M.
 - b. Air infiltration when tested according to ASTM E283.
 - c. Water penetration under static pressure when tested according to ASTM E331.
 - d. Water penetration under dynamic pressure when tested according to AAMA 501.1.
 - e. Structural performance at design load when tested according to ASTM E330/E330M.
 - f. Repeat air filtration when tested according to ASTM E283.
 - g. Repeat water penetration under static pressure when tested according to ASTM E 331.
 - h. Structural performance at maximum 150 percent of positive and negative wind-load design pressures when tested according to ASTM E330/E330M.
 - i. Condensation Resistance Factor (CRF) Test units in accordance with AAMA 1503.1
 - j. Thermal Resistance (U-Factor). Test units in accordance with NFRC 500.

1.05 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 glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
 - a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300 mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- E. Delegated-Design Submittal: For glazed aluminum curtain walls 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 Installer.
- B. Seismic Qualification Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
- E. Field quality-control reports.
- F. Warranties: Sample of special warranties.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- C. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. 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.

- 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- E. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
 - 1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls 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 created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. 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. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- 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. Kawneer North America; an Alcoa company. 2 1/2 inch (1600UT Wall System 1) Wall System. (Basis of Design)

- 2. YKK AP America Inc.
- 3. EFCO Corporation.

2.02 MATERIALS

- A. Aluminum Extrusions: ASTM B221: 6063-T6 alloy and temper or recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8) wall thickness at any location for the main frame.
- B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B209 (ASTM B209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
 - 4. Structural Profiles: ASTM B308/B308M.
 - 5. Extruded Aluminum: 6063-T6 alloy and temper.
- C. 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 A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2.03 FRAMING

- A. Framing Members: 2 1/2 inch (1600UT Wall System 1) inch wide manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads. 7 1/2 inch system depth minimum. Tested to AAMA 501 and TAS 202.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: outside glazed, retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- E. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer. All steel anchors shall be properly insulated from the aluminum.

- F. Pressure Plate: Pressure plate shall be either aluminum or fiberglass and fastened to the mullion with stainless steel screws. Fiberglass pressure plate shall be tested to ASTM D6938, ASTM D790, ASTM D695, ASTM D953 and ASTM D3846.
- G. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- H. Framing Sealants: Manufacturer's standard sealants.
- I. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for a minimum separation from interior to exterior metal of 1/4" (6mm).
- J. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.04 GLAZING

- A. Glazing: Comply with Section 088000 GLAZING.
- B. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Glazing System: 4-sided captured.
 - 2. Glazing Plane: Front.
- C. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers. Gaskets shall meet the requirements of ASTM C864.
- D. Glazing Sealants: As recommended by manufacturer for joint type.
 - 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Sealants used inside 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."
- E. Spacing and Setting Blocks: Manufacturer's standard elastomeric type.
- F. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.05 OPERABLE UNITS

A. Doors: Comply with Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.

2.06 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

- B. Versoleil[™] SunShade Outrigger/Single Blade System: An aluminum sunshade (consisting of outriggers, louvers, and fascia as indicated on the drawings. System shall be anchored directly to the vertical curtain wall mullions.
 - 1. Anchors shall be painted as selected by the Architect from the manufacturer's standard and custom paints and colors.
 - 2. Louvers and fascia shall be painted as selected by the Architect from the manufacturer's standard and custom paints and colors.
 - 3. Louvers and fascia shall be anodized as selected by the he Architect from the manufacturer's complete selection of anodized finishes.

2.07 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. All aluminum vertical and horizontal extrusions shall have a minimum wall thickness of .093" to .125".
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to the vertical mullions.
 - 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. Outside glazed curtain wall system shall be dry glazed with an exterior aluminum pressure plate and snap cover with interior and exterior
 - 7. Provisions for safety railings mounted between mullions at interior.
 - 8. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 9. Curtain wall system is able to accommodate separate interior and exterior finishes and colors.
- D. Fabricate components that, when assembled, have the following characteristics:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 ALUMINUM FINISHES

A. Kawneer Permanodic[™] (70% PVDF), AAMA 2605, Fluoropolymer Coating. Color: Dark Bronze

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, 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 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

3.03 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure non-movement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 7. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 GLAZING.

3.04 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).

- c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
- 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas of glazed aluminum curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.
 - 1. Air Infiltration: Areas shall be tested for air leakage of 0.06 cfm / sq. ft. of fixed wall area when tested according to ASTM E783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 - a. Test Area: One bay wide, but not less than 30 feet (9.1 m), by one story of glazed aluminum curtain wall.
 - b. Perform a minimum of three tests in areas as directed by Architect.
 - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 2. Water Penetration: Areas shall be tested according to ASTM E1105 at a minimum cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.
 - a. Test Area: One bay wide, but not less than 30 feet (9.1 m), by one story of glazed aluminum curtain wall.
 - b. Perform a minimum of three tests in areas as directed by Architect.
 - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 3. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Test Area: A minimum area of 45 feet (18 m) by one story of glazed aluminum curtain wall.
- C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.06 ADJUSTING, CLEANING AND PROTECTION

- A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period

END OF SECTION

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.

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.

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.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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.

- d. Deterioration of materials and finishes beyond normal weathering.
- e. Failure of insulating glass.
- 2. Warranty Period:
 - a. Window units: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. 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: 8225TL Thermal Windows Project-Out units.
 - 2. Kawneer North America; an Alcoa company: 8225TL Thermal Windows Casement units.
 - 3. Kawneer North America; an Alcoa company: 8225TL Thermal Windows Fixed units.
 - 4. 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. Test Size: 60 inches by 99 inches. Designation: AW-PG90-C.
- 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 90 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 135 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. Fixed Units: U-factor of 0.38 Btu/sq. ft. x h x deg F for fixed windows.
- 2. Operable Units: U-Factor of 0.28 BTU/hr/sf/°F. (Based on center of glass U-Factor range 0.10 to 0.48) with a 10 lb. Sill.
- 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 0.30 cfm/ft2 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 12 psf.
- J. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503:
 - 1. Outswing Casement: Provide aluminum windows tested for thermal performance with a CRF not less than 56 (frame) and 55 (glass).
 - 2. Fixed: Provide aluminum windows tested for thermal performance with a CRF not less than 59 (frame) and 57 (glass).
 - 3. Project-Out: Provide aluminum windows tested for thermal performance with a CRF not less than 56 (frame) and 55 (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. Recycled Content: Shall have a minimum of 50% mixed pre- and post-consumer recycled content.

- 1. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
- 2. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
- 3. Indicate location recovery of recycled content.
- 4. Indicate location of manufacturing facility.
- C. Thermal Barrier:
 - 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 8225TL Thermal Windows, 2-1/4" frame depth
 - 2. Approved equal.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Project-Out
 - 2. Fixed
 - 3. Casement
- 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. 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.

- F. 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. Project Out:
 - a. Stainless Steel 4-Bar Hinges
 - b. Cast White Bronze Cam Locks
 - 1) Provide Cam Handle with pole ring for windows located above reach (48" above finish floor).
 - 2. Casement:
 - a. Stainless Steel 4-Bar Hinges
 - b. Cast White Bronze Cam Locks
 - 1) Provide Cam Handle with pole ring for windows located above reach (48" above finish floor).

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. Extruded aluminum frames, 6063-T6 alloy and temper, joined at corners: 18 x 16 mesh aluminum screen cloth; frames finished to match aluminum windows; splines shall be extruded vinyl, removable to permit rescreening.
- 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 Permanodic[™] AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating. Color: As selected by the Architect form 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 AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - 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 AAMA/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

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Electrically operated and controlled hardware.
- D. Lock cylinders for doors with balance of hardware specified in other sections.
- E. Thresholds.
- F. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 080671 Door Hardware Schedule: Schedule of door hardware sets.
- B. Section 081113 Hollow Metal Doors and Frames.
- C. Section 081416 Flush Wood Doors.
- D. Section 084313 Aluminum-Framed Storefronts: Door hardware, except as noted in section.
- E. Section 281000 Access Control: Electronic access control devices.
- F. Section 284600 Fire Detection and Alarm: Electrical connection to activate door closers and release magnetic holders.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA A156.1 Standard for Butts and Hinges; 2021.
- C. BHMA A156.2 Bored and Preassembled Locks and Latches; 2022.
- D. BHMA A156.3 Exit Devices; 2020.
- E. BHMA A156.4 Door Controls Closers; 2019.
- F. BHMA A156.5 Cylinders and Input Devices for Locks; 2020.
- G. BHMA A156.6 Standard for Architectural Door Trim; 2021.
- H. BHMA A156.7 Template Hinge Dimensions; 2016.
- I. BHMA A156.8 Door Controls Overhead Stops and Holders; 2021.
- J. BHMA A156.13 Mortise Locks & Latches Series 1000; 2022.
- K. BHMA A156.15 Release Devices Closer Holder, Electromagnetic and Electromechanical; 2021.
- L. BHMA A156.18 Materials and Finishes; 2020.

- M. BHMA A156.21 Thresholds; 2019.
- N. BHMA A156.22 Standard for Gasketing; 2021.
- O. BHMA A156.26 Standard for Continuous Hinges; 2021.
- P. BHMA A156.28 Standard for Recommended Practices for Mechanical Keying Systems; 2018.
- Q. BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames; 2016.
- R. BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- S. DHI (H&S) Sequence and Format for the Hardware Schedule; 2019.
- T. DHI (KSN) Keying Systems and Nomenclature; 2019.
- U. DHI (LOCS) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- V. DHI WDHS.3 Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- W. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.
- X. ITS (DIR) Directory of Listed Products; Current Edition.
- Y. MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests; 2019h.
- Z. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- AA. NFPA 80 Standard for Fire Doors and Other Opening Protectives; 2022.
- AB. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.
- AC. NFPA 252 Standard Methods of Fire Tests of Door Assemblies; 2022.
- AD. UL (DIR) Online Certifications Directory; Current Edition.
- AE. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- AF. UL 1034 Standard for Safety Burglary-Resistant Electrical Locking Mechanisms; Current Edition, Including All Revisions.
- AG. UL 1784 Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.
- 1.04 ADMINISTRATIVE REQUIREMENTS
 - A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
 - B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Door Hardware Installer.
 - 3. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.
 - 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Access control requirements.
 - b. Key control system requirements.
 - c. Schematic diagram of preliminary key system.
 - d. Flow of traffic and extent of security required.
 - 5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 - 6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
 - a. Submit in vertical format.
 - 3. Include complete description for each door listed.
- D. Shop Drawings Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).

- 2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
- 3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Supplier's qualification statement.
- I. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- J. Keying Schedule:
 - 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- L. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- M. Maintenance Materials and Tools: 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. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

- B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
 - 1. Closers: Five years, minimum.
 - 2. Exit Devices: Three years, minimum.
 - 3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Closers:
 - 1. Provide door closer on each exterior door, unless otherwise indicated.
 - 2. Provide door closer on each fire-rated and smoke-rated door.
 - 3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
- D. Overhead Stops and Holders (Door Checks):.
 - 1. Provide stop for every swinging door, unless otherwise indicated.
 - 2. Overhead Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.
 - 3. Overhead stop is not required if a floor or wall stop has been specified for the door.
- E. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.
- F. Thresholds:
 - 1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.
- G. Weatherstripping and Gasketing:
 - 1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
 - 2. Provide door bottom sweep on each exterior door, unless otherwise indicated.
 - 3. Fabricate as continuous gasketing, do not cut or notch gasketing material.
- H. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
- I. See Section 281000 for additional access control system requirements.
- J. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.

- 3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
- 4. Provide wall grip inserts for hollow wall construction.
- 5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
 - 5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
 - 6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 - 7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 - 8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

- A. Manufacturers: Conventional butt hinges.
 - 1. BEST; dormakaba Group.
 - 2. McKinney.
 - 3. Hager Companies.
- B. Properties:
 - 1. Butt Hinges: As applicable to each item specified.
 - a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
 - b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
 - c. Template screw hole locations.
 - d. Bearing assembly installed after plating.
 - e. Bearings: Exposed fully hardened bearings.
 - f. Bearing Shells: Shapes consistent with barrels.
 - g. Pins: Easily seated, non-rising pins.
 - 1) Fully plate hinge pins.
 - 2) Non-Removable Pins: Slotted stainless steel screws.
 - h. UL 10C listed for fire-resistance-rated doors.
 - 2. Continuous Hinges: As applicable to each item specified.
 - a. Geared Continuous Hinges: As applicable to each item specified.
 - 1) Non-handed.
 - 2) Anti-spinning through-fastener.
 - 3) UL 10C listed for fire-resistance-rated doors.
 - (a) Metal Door Installation: Rated up to 90 minutes.

- (b) Wood Door Installation: Rated up to 60 minutes.
- 4) Sufficient size to permit door to swing 180 degrees
- C. Sizes: See Door Hardware Schedule.
 - 1. Hinge Widths: As required to clear surrounding trim.
 - 2. Sufficient size to allow 180 degree swing of door.
- D. Finishes: See Door Hardware Schedule.
 - 1. Fully polish hinges; front, back, and barrel.
- E. Grades:
 - 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - 2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.
- F. Material: Base metal as indicated for each item by BHMA material and finish designation.
- G. Types:
 - 1. Butt Hinges: Include full mortise hinges.
 - 2. Continuous Hinges: Include geared hinges.
- H. Options: As applicable to each item specified.
 - 1. Provide electric power transfer (EPT) as listed in hardware sets.
- I. Quantities:
 - Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
 - a. Hinge weight and size unless otherwise indicated in hardware sets:
 - 1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
 - 4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
 - 2. Continuous Hinges: One per door leaf.
- J. Applications: At swinging doors.
 - 1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.
- K. Products:
 - 1. Butt Hinges:
 - a. Ball Bearing, Five (5) Knuckle.
 - 2. Continuous Hinges:
 - a. Aluminum geared hinges.
- 2.04 BOLTS
 - A. Manufacturers:
 - 1. Trimco.

- 2. ABH.
- 3. Rockwood.
- B. Properties:
 - 1. Flush Bolts:
 - a. Automatic Flush Bolts: Automatically latching upon closing of door leaf.
 1) Bolt Throw: 3/4 inch (19 mm), minimum.
 - 2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.
- C. Options:
 - 1. Lever extensions: Provide for top bolt at oversized doors.
- D. Products:
 - 1. Automatic flush bolts.

2.05 EXIT DEVICES

- A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. Von Duprin.
 - 3. Sargent.
- B. Properties:
 - 1. Actuation: Full-length touchpad.
 - 2. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
 - 3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
 - 4. Lever Design: Match project standard lockset trims.
 - 5. Cylinder: Include where cylinder dogging or locking trim is indicated.
 - 6. Strike as recommended by manufacturer for application indicated.
 - 7. Sound dampening on touch bar.
 - 8. Dogging:
 - a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch (6 mm) hex key dogging.
 - b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
 - 9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.
 - 10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
 - 11. Handing: Field-reversible.
 - 12. Fasteners on Back Side of Device Channel: Concealed exposed fasteners not allowed.
 - 13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.
- C. Grades: Complying with BHMA A156.3, Grade 1.
 - 1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
- D. Options:
 - 1. MLR: Motorized latch retraction.
 - 2. Weatherized True Architectural Finish: Provide where indicated in Door Hardware Schedule as 626W.
 - a. Weatherized exterior components to include active case cover, touch bar, device channel, slide channel fillers, vertical rods, latch covers, and device end cap.
 - 1) Base Metal Material: Brass.
 - 2) Plated Finish: Satin nickel and chrome, using a double-dip, two-step process.

- b. Performance Requirements:
 - 1) BHMA A156.18 Salt Spray Certified using 600 Hours of testing, 3 times longer than the Standard's requirements.
 - 2) MIL-STD-810G 509.6 Salt Fog Certified.
 - 3) MIL-STD-810G 510.6 Sand and Dust Certified.
 - 4) MIL-STD-810G 521.4 Icing or Freezing Rain Certified.
- c. Compatible non-weatherized electrified options as specified in Door Hardware Schedule.
- 3. WTS touch bar switch.
- 4. WALW hardwired exit alarm.
- E. Products:
 - 1. 2000.

2.06 ELECTRIC STRIKES

- A. Manufacturers:
 - 1. RCI; dormakaba Group.
 - 2. Von Duprin.
 - 3. HES.
- B. Properties:
 - 1. Provide UL (DIR) listed burglary-resistant devices.
 - 2. Provide UL 1034 compliant devices.
 - 3. Provide UL 10C compliant devices.
 - 4. Non-handed devices suitable for door frame material and scheduled lock configuration.
 - 5. Include transformer and rectifier as necessary for complete installation.
 - 6. Holding Force: 1,500 lbs (680.4 kg).
 - 7. Accommodating latch projections of 1/2 inch (13 mm), 5/8 inch (16 mm), or 3/4 inch (19 mm).
- C. Options: As applicable to each item specified.
 - 1. Voltage: 24 VDC.
- D. Installation: Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.
- E. Products:
 - 1. 0162.
 - 2. 4104.

2.07 LOCK CYLINDERS

- A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. Substitutions: Not permitted.
- B. Properties:

1

- Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - a. Provide cylinders from same manufacturer as locking device.
 - b. Provide cams and/or tailpieces as required for locking devices.
 - c. Provide cylinders with appropriate format interchangeable cores where indicated.
- C. Grades:
 - 1. Standard Security Cylinders: Comply with BHMA A156.5.

- 1. Manufacturer's standard corrosion-resistant brass alloy.
- E. Types: As applicable to each item specified.
 - 1. Standard security standard, electronic, conventional, full size interchangeable core (FSIC), and small format interchangeable core (SFIC) type cylinders, with seven-pin?, 1C 7-pin cores.
- F. Applications: At locations indicated in hardware sets, and as follows
 - 1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
 - a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.
- G. Products:
 - 1. Rim/mortise.
- 2.08 MORTISE LOCKS
 - A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. Schlage.
 - 3. Sargent.
 - B. Properties:
 - 1. Mechanical Locks: Manufacturer's standard.
 - a. Fitting modified ANSI A115.1 door preparation.
 - b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
 - c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
 1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
 - d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
 - e. Backset: 2-3/4 inch (70 mm).
 - f. Lever Trim:
 - 1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
 - Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - 3) Spindle: Designed to prevent forced entry from attacking of lever.
 - 4) Independent spring mechanism for each lever.
 - (a) Trim to be self-aligning and thru-bolted.
 - 5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
 - 6) Levers to operate a roller bearing spindle hub mechanism.
 - 2. Electrified Locks: Same properties as standard locks, and as follows:
 - a. Voltage: 24 VDC.
 - b. Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.
 - C. Finishes: See Door Hardware Schedule.
 - 1. Core Faces: Match finish of lockset.

- D. Grades:
 - 1. Comply with BHMA A156.13, Grade 1.
- E. Options:
 - 1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.
- F. Products: Mortise locks, including standard and electrified types.
 - 1. 40H.

2.09 CYLINDRICAL LOCKS

- A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. Schlage.
 - 3. Sargent.
- B. Properties:
 - 1. Mechanical Locks:
 - a. Fitting modified ANSI A115.2 door preparation.
 - b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
 - c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
 - 1) Through-bolted anti-rotational studs.
 - d. Bored Hole: 2-1/8 inch (54 mm) diameter.
 - e. Backset: 5 inches (127 mm) unless otherwise indicated.
 - f. Latch: Single piece tail-piece construction.
 - 1) Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
 - g. Cylinders:
 - 1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
 - h. Lever Trim:
 - 1) Style: See Door Hardware Schedule.
 - 2) Outside Lever Sleeve: Seamless one-piece construction.
- C. Finishes: See Door Hardware Schedule.
 - 1. Core Faces: Match finish of lockset.
- D. Grades: Comply with BHMA A156.2, Grade 1?, Series 4000, Operational Grade 1, Extra Heavy Duty.
- E. Material: Manufacturer's stadard for specified lock.
 - 1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
- F. Options:
 - 1. Regulatory Compliance: As required by authorities having jurisdiction the State in which the Project is located.
- G. Products: Cylindrical locks, including mechanical types.
 - 1. 9K.
- 2.10 KEYPAD LOCKS STAND-ALONE
 - A. Manufacturers:

1. dormakaba; dormakaba Group.

B. Properties:

- 1. Fit ANSI A115.1 door preparation.
- 2. One-piece, 9/16 inch (14 mm) throw.
- 3. Keypad integrated into lockset escutcheon.
- 4. Weatherproof bezel and gasket provide protection for outdoor use.
- 5. Interchangeable core key by-pass where specified restricted keyway.
- 6. PowerPlex Technology: Self-powered electronic pushbutton locking.
 - a. Self-Power Configuration: Power generated with every turn of the lever.
 - b. Built-In Capacities: Capable of holding a full charge for up to 10 weeks with no activity at the lock.
 - c. Programming: At lock, via keypad, without removing lock from the door
 - d. Authority Levels: Five (5).
 - 1) One-Time Access: Programmable for one-time assess or come-'and'go access for 1 to 24 hours.

C. Grades:

- 1. Tested and approved for compliance with BHMA A156.2, Series 4000, Operational Grade.
- 2. UL listed for GYQS single point locks for use on 3 hour fire-resistance-rated, A label single doors (4'x10') GYJB. Listing applies for both U.S. and Canada applications.
- 3. Tested and approved for compliance with BHMA A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and approved by UL 10C.
- 4. Complying with BHMA A156.25 and UL GYQS listed.
- 5. Complying with US FCC, Canadian FCC, and European EMC requirements.
- D. Products:
 - 1. P2000 PowerPlex.

2.11 DOOR PULLS AND PUSH PLATES

- A. Manufacturers:
 - 1. Trimco.
 - 2. Rockwood.
 - 3. Don-Jo.

B. Properties:

- 1. Pull Type: Straight, unless otherwise indicated.
- 2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
 - a. Edges: Beveled, unless otherwise indicated.
- C. Grades: Comply with BHMA A156.6.
- D. Material: Stainless steel, unless otherwise indicated.
- E. Products:
 - 1. Push-Pull Plates.

2.12 COORDINATORS

- A. Manufacturers:
 - 1. Trimco.
 - 2. Rockwood.
 - 3. Don-Jo.

- B. Properties:
 - 1. General: Non-handed devices, with field-selectable active door leaf.
 - 2. Coordinators: Devices on pairs of doors with closers and self-latching or automatic flush bolts installed.
 - a. Coordinator Operation: Only when inactive door is opened.

C. Grades:

- 1. Closer and Coordinator Combinations: Comply with BHMA A156.4, Grade 1.
- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
 - 1. Meet UL 10C for Positive Pressure.
- E. Types:
 - 1. Coordinators: Bar.
- F. Installation:
 - 1. Mounting: Provide necessary mounting brackets and filler bars to ensure proper installation of coordinator and related hardware.
 - 2. Coordination: Properly sequence installation of other door hardware affected by placement of coordinators and carry bars.
- G. Products:
 - 1. 3090 Series.

2.13 CLOSERS

- A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. dormakaba; dormakaba Group.
 - 3. LCN.
 - 4. Sargent.

B. Properties:

- 1. Surface Mounted Closers: Manufacturer's standard.
 - a. Construction: Cast iron.
 - b. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
 - c. Hydraulic Fluid: All-weather type.
 - d. Arm Assembly: Standard for product specified.
 - 1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
 - 2) Parallel arm to be a heavy-duty rigid arm.
 - 3) Where "IS" or "S-IS" arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
 - e. Covers:
 - 1) Type: Standard for product selected.
 - (a) Full.
 - 2) Material: Plastic.
 - 3) Finish: Painted.
- C. Grades:
 - 1. Closers: Comply with BHMA A156.4, Grade 1.

- 1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 - (a) UL 228 Door Closers-Holders, With or Without Integral Smoke Detectors.
- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
 - 1. Devices listed with California Department of Forestry and Fire Protection, Office of the State Fire Marshal.
- E. Types:
 - 1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.
- F. Options:
 - 1. Delayed action, adjustable with an independent valve.
- G. Installation:
 - 1. Mounting: Includes surface mounted installations.
 - 2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
 - 3. At outswinging exterior doors, mount closer on interior side of door.
 - 4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
 - 5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
- H. Products:
 - 1. Surface Mounted:
 - a. EHD9000
 - b. 8900.

2.14 OVERHEAD STOPS AND HOLDERS

- A. Manufacturers:
 - 1. dormakaba; dormakaba Group.
 - 2. ABH.
 - 3. Rockwood.
- B. Sizes: Manufacturer's standard for the application.
- C. Finishes:
 - 1. Arms and Brackets: Zinc-plated.
- D. Grades: As applicable to item specified.
 - 1. Comply with BHMA A156.8, Grade 1.
- E. Material: Base metal as indicated for each item by BHMA material and finish designation.
 - 1. Track Channel: Extruded aluminum alloy.
 - 2. Slide Block: Machined from solid brass alloy.
- F. Types:
 - 1. Surface-applied.
- G. Products:
 - Surface Overhead Stops and Holders:
 a. 700 Standard Duty.

- A. Manufacturers:
 - 1. Trimco.
 - 2. Rockwood.
 - 3. Don-Jo.
- B. Properties:
 - 1. Plates:
 - a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - b. Mop Plates: Provide along bottom edge of push side of doors to provide protection from cleaning liquids and equipment damage to door surface.
 - c. Edges: Beveled, on four (4) unless otherwise indicated.
- C. Grades: Comply with BHMA A156.6.
- D. Material: As indicated for each item by BHMA material and finish designation.
 - 1. Metal Properties: Stainless steel.
- E. Installation:
 - 1. Fasteners: Countersunk screw fasteners
- F. Products:
 - 1. K0050.

2.16 STOPS AND HOLDERS

- A. Manufacturers:
 - 1. Trimco.
 - 2. Rockwood.
 - 3. Don-Jo.
- B. General: Provide overhead stop/holder when wall or floor stop is not feasible.
- C. Grades:
 - 1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.
- D. Material: Base metal as indicated for each item by BHMA material and finish designation.
- E. Types:
 - 1. Wall Bumpers: Bumper, concave, wall stop.
- F. Installation:
 - 1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.
- G. Products:
 - 1. Wall Bumpers.

2.17 ELECTROMAGNETIC DOOR HOLDERS

- A. Manufacturers:
 - 1. dormakaba; dormakaba Group.

- 2. ABH.
- 3. Rixson.
- B. Properties:
 - 1. Holding Force, Standard Duty: 40 lbs-force (177 N), minimum.
 - 2. Power Loss Status: Fail safe; door released to close.
 - 3. Life Safety Interface: With fire detectors, fire-alarm system, and smoke detectors for fire-resistance-rated door assemblies.
- C. Grades: Comply with BHMA A156.15.
- D. Types: Wall mounted, single unit, standard duty, with strike plate attached to door.
- E. Options: As applicable to each item specified.1. Voltage: 24 VDC.
- F. Products:
 - 1. EM Series.

2.18 THRESHOLDS

- A. Manufacturers:
 - 1. National Guard Products, Inc.
 - 2. Reese.
 - 3. Pemko.
- B. Properties:
 - 1. Threshold Surface: Fluted horizontal grooves across full width.
- C. Grades: Thresholds: Comply with BHMA A156.21.
- D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.
- E. Products:

2.19 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. National Guard Products, Inc.
 - 2. Pemko.
 - 3. Zero.
- B. Properties:
 - 1. Adhesive-Backed Perimeter Gasketing: Silicone gasket material applied to frame with self- adhesive.
 - 2. Rigid, Housed, Perimeter Gasketing: Sponge silicone gasket material held in place by aluminum housing; fastened to frame stop with screws.
 - 3. Overlapping Astragals for Meeting Stiles: Neoprene strip gasket material held in place by aluminum housing and overlapping when doors are closed; mounted to face of meeting stile with screws; surface mounted to door.
 - 4. Door Sweeps: Neoprene gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws.
 - 5. Door Shoes: Thermoplastic elastomer gasket material held in place by metal retainer; mounted to bottom edge of door with screws.
 - a. Mounting: Surface mounted on bottom edge of door.

- C. Grades: Comply with BHMA A156.22.
- D. Products:
 - 1. Weatherstripping: See Door Hardware Schedule.
 - 2. Smoke Seals: See Door Hardware Schedule.
 - 3. Sound Seals: See Door Hardware Schedule.
 - 4. Meeting Stile Seals: See Door Hardware Schedule.
 - 5. Door Bottom Seals:
 - a. Door Sweeps: See Door Hardware Schedule.
 - b. Door Bottoms: See Door Hardware Schedule.
 - c. Door Shoes: See Door Hardware Schedule.
- 2.20 MISCELLANEOUS ITEMS
 - A. Properties:
 - 1. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - a. Single Door: Provide three on strike jamb of frame.
 - b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - c. Material: Rubber, gray color.
 - B. Products:
 - 1. Silencers.

2.21 ELECTRIFIED HARDWARE

- A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. RCI; dormakaba Group.
 - 3. Von Duprin.
 - 4. Sargent.
- B. Properties:
 - 1. Door Position Switches: Recessed devices with magnetic contacts.
 - a. Power Requirement: 50mA Max, 100 VDC.
 - b. SPDT configuration.
 - 2. Power Supply Units: Manufacturer's standard.
 - a. Enclosures: Lockable NEMA Type 1, with hinged cover and knockouts.
 - b. Power: 24 VAC, 10 Amp; field-selectable.
 - c. Emergency Release Terminals: Designed to release devices upon activation of fire alarm system.
 - d. Auxiliary contacts for remote signaling.
 - e. User-selectable time delay from 0 to 4 minutes.
 - f. Fire Alarm System Interface: Standard.
 - 1) Fire alarm terminal with green LED indicating power is available.
 - g. Output Distribution Board with indicator LEDs.
 - h. On/Off LED power indicator.
 - 3. Power Transfers: Manufacturer's standard.
 - a. Door Loops:
 - 1) Armored flex conduits 18 inches (450 mm) long.
 - 2) Capacity: Up to 1/4 inch (6.35 mm) diameter wire bundle.
 - 4. Wire Harnesses: Of sufficient length, with quick connectors.
 - a. Wire Harness End Connection to Power Supply or Junction Box: One end with bare leads.

C. Products:

- 1. Door Position Switches:
 - a. 9540 Recessed Magnetic Contact/Door Position Switch.
- 2. Power Supplies:
 - a. BY SECURITY PROVIDER.
- Power Transfers:
 a. EPT-12C.
- 4. Wire Harnesses:
 - a. BEST wire harnesses.

2.22 KEYS AND CORES

- A. Manufacturers:
 - 1. BEST, dormakaba Group.
 - 2. Substitutions: Not permitted.
- B. Properties: Complying with guidelines of BHMA A156.28.
 - 1. Provide small format interchangeable core.
 - 2. Provide Patented CORMAX keys and cores.
 - 3. Provide keying information in compliance with DHI (KSN) standards.
 - 4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
 - 5. Keying: Master keyed.
 - 6. Include construction keying and control keying with removable core cylinders.
 - 7. Supply keys in following quantities:
 - a. Master Keys: 4 each.
 - b. Construction Master Keys: 6 each.
 - c. Construction Keys: 15 each.
 - d. Construction Control Keys: 2 each.
 - e. Control Keys if New System: 2 each.
 - 8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
 - 9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
 - 10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
 - 11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.
- C. Products:
 - 1. Patented:
 - a. CORMAX.

2.23 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

- B. Correct all defects prior to proceeding with installation.
- C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware using the manufacturer's fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.
- C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- D. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- E. Use templates provided by hardware item manufacturer.
- F. Do not install surface mounted items until application of finishes to substrate are fully completed.
- G. Wash down masonry walls and complete painting or staining of doors and frames.
- H. Complete finish flooring prior to installation of thresholds.
- I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Steel Doors and Frames: See Section 6549.
 - 3. For Steel Door Frames: See Section 081213.
 - 4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
 - 5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 6. Flush Wood Doors: See Section 081416.
 - 7. Stile and Rail Wood Doors: See Section 081433.
 - 8. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch (1024 mm).
 - b. Push Plates/Pull Bars: 42 inch (1067 mm).
 - c. Deadlocks (Deadbolts): 48 inch (1219 mm).
 - d. Exit Devices: 40-5/16 inch (1024 mm).
 - e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).
- J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
- K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 017000 Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation activities.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- D. See Section 017419 Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

- A. Protect finished Work under provisions of Section 017000 Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

3.07 HARDWARE SETS

MANUFACTURER LIST

| Code: | Name: |
|-------|-------------------------|
| BES | BEST |
| PRE | BEST (Precision) |
| DK | dormakaba |
| DKA | dormakaba Architectural |
| МсК | McKinney |
| NGP | National Guard Products |
| RCI | Rutherford Controls Inc |
| TRI | Trimco |

OPTION LIST

| CODE: LBR | NAME: LESS BOTTOM ROD |
|--------------|---------------------------------|
| 45X45 | 4.5" X 4.5" |
| WTS | WEATHERIZED TOUCHBAR MONITORING |
| | SWITCH |
| RQE | REQUEST TO EXIT |
| B4E | HEAVY BEVEL EDGES |
| FL | FIRE RATED HARDWARE |
| | |

TRFD2302 Thiells Roseville Fire District New Fire Headquarters

| VIB | DOUBLE VISUAL INDICATOR |
|------------------|------------------------------------|
| PATD | PATENTED KEYED CORE |
| LDW | LESS DOOR WIDTH |
| MLR | MOTORIZED LATCH RETRACTION |
| HEAD & JAMBS (2) | PROVIDE AT THE HEAD AND BOTH JAMBS |
| LAR | LENGTH AS REQUIRED |
| CSK | COUNTER SUNK HOLES |
| F | FIRE RATING |
| FINISH LIST | |
| CODE: | NAME: |
| 689 | ALUMINUM |
| 626W | WEATHERIZED SATIN CHROME |
| BLK | BLACK |
| 626 | SATIN CHROME |
| 630 | SATIN STAINLESS STEEL |
| 316S | 316 SATIN STAINLESS STEEL |
| 26D | DULL CHROMIUM |
| US27 | MILL ALUMINUM |
| A | ANODIZED ALUMINUM |
| BK | BLACK |
| GRAY | GRAY RUBBER |
| 32D | SATIN STAINLESS STEEL |

CHARCOAL

С

HARDWARE SETS

SET #1

DOORS: 100A, 100B, 105B

| 2 | HINGE | 662HD EPT PREP LAR | BK | BES |
|---|----------------|-----------------------|------|-----|
| 2 | POWER TRANSFER | EPT-12C | | PRE |
| 1 | EXIT DEVICE | 2603 C MLR WTS B 2903 | 626W | PRE |
| 1 | EXIT DEVICE | 2602 MLR WTS B 2902 | 626W | PRE |
| 1 | RIM CYLINDER | 12E 7 2 PATD RP | 626 | BES |
| 2 | DOOR CLOSER | EHD90 16 SDST90 | 689 | BES |
| 1 | THRESHOLD | 896N-ADJ LAR | BLK | NGP |
| 1 | WEATHERSTRIP | BY ALUM. DR. MFG. | | |
| 1 | DOOR BOTTOM | 101V LAR | US27 | NGP |
| 2 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |
| 2 | WIRING HARNESS | WH-192 | | BES |
| 2 | WIRING HARNESS | WH-1 | | BES |
| 2 | WIRING HARNESS | WH-6E2 | | BES |
| 1 | POWER SUPPLY | RPSMLR2 | | PRE |
| 1 | CARD READER | BY SECURITY PROVIDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOORS NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RETRACT LATCH ON EXIT DEVICE. DOOR POSITION SWITCH MONITORS DOOR STATUS. REQUEST TO EXIT SWITCH IN BAR SHUNTS SIGNAL TO ALARM PANEL. DOORS WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #2

DOORS: 100C, 107A

| 1 1 | HINGE POWER TRANSFER | 662HD EPT PREP LAR EPT-12C | ВК | BES PRE |
|--------|-------------------------|-------------------------------|------|------------|
| 1 | EXIT DEVICE | 2403 MLR WTS B 2903 | 626W | PRE |
| 1 | RIM CYLINDER | 12E 7 2 PATD RP | 626 | BES |
| 1 | DOOR CLOSER | EHD90 16 SDS90 DP90 | 689 | BES |
| 2 | DOOR CLOSER | EHD90 16 SDST90 | 689 | BES |
| 1 | THRESHOLD | 896N-ADJ LAR | BLK | NGP |
| 1 | WEATHERSTRIP | BY ALUM DR. MFG. | | |
| 1 | DOOR BOTTOM | 101V LAR | US27 | NGP |
| 1 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |
| 1 | WIRING HARNESS | WH-192 | | BES |
| 1 | WIRIING HARNESS | WH-12 | | BES |
| 1 | WIRING HARNESS | WH-6E | | BES |
| 1 | POWER SUPPLY | RPSMLR2 | | PRE |
| 1 | CARD READER | BY SECURITY PROVIDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOORS NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RETRACT LATCH ON EXIT DEVICE. DOOR POSITION SWITCH MONITORS DOOR STATUS. REQUEST TO EXIT SWITCH IN BAR SHUNTS SIGNAL TO ALARM PANEL. DOORS WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #3

DOORS: 112A, 120

| 1 | HINGE | 662HD EPT PREP LAR | BK | BES |
|---|----------------|------------------------|------|-----|
| 1 | POWER TRANSFER | EPT-12C | | PRE |
| 1 | EXIT DEVICE | 2103 MLR WTS 4903 B | 626W | PRE |
| 1 | RIM CYLINDER | 12E 7 2 PATD RP | 626 | BES |
| 1 | DOOR CLOSER | EHD90 16 SDS90 | 689 | BES |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK | 630 | TRI |
| | | B4E | | |
| 1 | THRESHOLD | 950V LAR | US27 | NGP |
| 1 | GASKETING | 127S HEAD & JAMBS (2) | A | NGP |
| 1 | DOOR BOTTOM | 101V LAR | US27 | NGP |
| 1 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |
| 1 | WIRING HARNESS | WH-192 | | BES |
| 1 | WIRING HARNESS | WH-12 | | BES |
| 1 | WIRING HARNESS | WH-6E | | BES |
| | | | | |

| 1 | POWER SUPPLY | RPSMLR2 | PRE |
|---|--------------|-------------|-----|
| 1 | CARD READER | BY SECURITY | PRE |
| | | PROVIDER | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RETRACT LATCH ON EXIT DEVICE. DOOR POSITION SWITCH MONITORS DOOR STATUS. REQUEST TO EXIT SWITCH IN BAR SHUNTS SIGNAL TO ALARM PANEL. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #4

DOORS: 122

| 1 | HINGE | 662HD LAR | BK | BES |
|---|-----------------|------------------------|------|-----|
| 1 | EXIT DEVICE | 2103 | 626W | PRE |
| 1 | ELECTRONIC | P20 1 U B LL | 626 | DK |
| | PUSHBUTTON TRIM | | | |
| 1 | INTERCHANGABLE | 1CM 7 | 626 | BES |
| | CORE | | | |
| 1 | DOOR CLOSER | EHD90 16 SDS90 | 689 | BES |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK | 630 | TRI |
| | | B4E | | |
| 1 | THRESHOLD | 950V LAR | US27 | NGP |
| 1 | GASKETING | 127S HEAD & JAMBS (2) | A | NGP |
| 1 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOORS NORMALLY CLOSED AND LOCKED. VALID CODE AT KEYPAD WILL RELEASE LEVEL AND ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOORS WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #5

DOORS: 104, 104A

| 3 | HINGE | FBB168 45X45 (NRP AS | 26D | BES |
|---|---------------|------------------------|------|-----|
| | | REQ'D) | | |
| 1 | PASSAGE SET | 9K 3 0 N 16 K | 626 | BES |
| 1 | OVERHEAD STOP | 700 S SERIES | 626 | DK |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK | 630 | TRI |
| | | B4E | | |
| 3 | SILENCER | 1229A | GRAY | TRI |

SET #6

DOORS: 101A, 107, 108, 109, 115, 116, 201A, 208

| 3 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|-------|--------------------------------|-----|-----|
| | | | | |

| 1 | STOREROOM LOCK | 9K 3 7 D 15 D PATD | 626 | BES |
|---|-----------------|------------------------|------|-----|
| 1 | ELECTRIC STRIKE | 4104 (FAIL SECURE) | 32D | RCI |
| 1 | DOOR CLOSER | 89 16 IS FC SN1 | 689 | DKA |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK | 630 | TRI |
| | | B4E | | |
| 3 | SILENCER | 1229A | GRAY | TRI |
| 1 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |
| 1 | POWER SUPPLY | BY SECURITY | | |
| | | PROVIDER | | |
| 1 | CARD READER | BY SECURITY | | |
| | | PROVIDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #7

DOORS: M05

| 6 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|--------------|--------------------------------|------|-----|
| 1 | FLUSH BOLT | 3915 | 630 | TRI |
| 1 | SURFACE BOLT | 3922 | 630 | TRI |
| 2 | DUMMY LEVER | 9K 3 0 1DT 15 D | 626 | BES |
| 2 | WALL STOP | 1270 CV/CX | 626 | TRI |
| 3 | SILENCER | 1229A | GRAY | TRI |

SET #8

DOORS: 114, 121

| 5 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|---------------------------|--------------------------------|-------|------|
| 1 | HINGE | CE FBB168 54 45X45 | 26D | BES |
| 2 | FLUSH BOLT | 3913 | 630 | TRI |
| 1 | STRIKE | 3910 | 630 | TRI |
| 1 | ELECTROMECHANICAL LOCK | 9KW 3 7 DEU 15 D RQE PATD | 626 | BES |
| 1 | DOOR CLOSER | 89 16 ISH FC SN1 | 689 | DKA |
| 1 | OVERHEAD STOP | 90 2 H | 689 | DK |
| 2 | KICK PLATE | K0050 12" X 1" LDW CSK B4E | 630 | TRI |
| 2 | SILENCER | 1229A | GRAY | TRI |
| 1 | WIRING HARNESS | WH-44 | CIVII | BES |
| 1 | WIRING HARNESS | WH-192 | | BES |
| 1 | WIRING HARNESS | WH-6E | | BES |
| 2 | DOOR POSITION | 9540 | В | RCXI |
| | SWITCH | | | |
| 1 | POWER SUPPLY | BY SECURITY | | |
| | | PROVIDER | | |
| | | | | |

1 CARD READER BY SECURITY PROVDER

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE LEVER TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. REQUEST TO EXIT SWITCH IN LEVER SHUNTS SIGNAL TO ALARM PANEL. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #9

DOORS: 204

| 5 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|---------------------------|--------------------------------|------|-----|
| 1 | HINGE | CE FBB168 54 45X45 | 26D | BES |
| 1 | FLUSH BOLT | 3815LX3815L | 630 | TRI |
| 1 | STRIKE | 3910 | 630 | TRI |
| 1 | ELECTROMECHANICAL LOCK | 9KW 3 7 DEU 15 D RQE PATD | 626 | BES |
| 1 | DOOR CLOSER | 89 16 SDST FC SN1 | 689 | DKA |
| 2 | KICK PLATE | K0050 12" X 1" LDW CSK B4E | 630 | TRI |
| 1 | WALL STOP | 1270 CV/CX | 626 | TRI |
| 2 | SILENCER | 1229A | GRAY | TRI |
| 1 | WIRING HARNESS | WH-44 | | BES |
| 1 | WIRING HARNESS | WH-192 | | BES |
| 1 | WIRING HARNESS | WH-6E | | BES |
| 2 | DOOR POSITION SWITCH | 9540 | В | RCI |
| 1 | POWER SUPPLY | BY SECURITY PROVIDER | | |
| 1 | POWER SUPPLY | BY SECURITY PROVIDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOORS NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE LEVER TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. REQUEST TO EXIT SWITCH IN LEVER SHUNTS SIGNAL TO ALARM PANEL. DOORS WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #10

DOORS: 201

| 6 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|-------------|--------------------------------|-----|-----|
| 1 | FLUSH BOLT | 3815LX3815L | 630 | TRI |
| 1 | STRIKE | 3910 | 630 | TRI |
| 1 | PASSAGE SET | 9K 3 0 N 16 K | 626 | BES |
| 2 | DOOR CLOSER | 89 16 IS FC SN1 | 689 | DKA |

| 2 | KICK PLATE | K0050 12" X 1" LDW CSK B4E | 630 | TRI |
|---|------------|-------------------------------|------|-----|
| 2 | MOP PLATE | KM050 12" X 1" LDW CSK B4E | 630 | TRI |
| 2 | SILENCER | 1229A | GRAY | TRI |

SET #11

DOORS: 102, 106, 202, 205, 206

| 3 | HINGE | FBB179 45X45 (NRP AS REQ'D) | 26D | BES |
|---|-------------------------|--------------------------------|------|-----|
| 1 | STOREROOM LOCK | 9K 3 7 D 15 D PATD | 626 | BES |
| 1 | ELECTRIC STIKE | 4104 (FAIL SECURE) | 32D | RCI |
| 1 | OVERHEAD STOP | 700 S SERIES | 626 | DK |
| 3 | SILENCER | 1229A | GRAY | TRI |
| 1 | DOOR POSITION SWITCH | 9540 | В | RCI |
| 1 | POWER SUPPLY | BY SECURITY PROVIDER | | |
| 1 | CARD READER | BY SECURITY PROVIDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #12

DOORS: 119

| 3 | HINGE | FBB179 45X45 (NRP AS REQ'D) | 26D | BES |
|---|-----------------|--------------------------------|------|-----|
| 1 | STOREROOM LOCK | 9K 3 7 15 D PATD | 626 | BES |
| 1 | ELECTRIC STRIKE | 4104 (FAIL SECURE) | 32D | RCI |
| 1 | OVERHEAD STOP | 700 S SERIES | 626 | DK |
| 1 | THRESHOLD | 513 LAR | US27 | NGP |
| 1 | GASKETING | 5075 HEAD & JAMBS (2) | С | NGP |
| 1 | DOOR SHOE | 12T LAR | US27 | NGP |
| 3 | SILENCER | 1229A | GRAY | TRI |
| 1 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |
| 1 | POWER SUPPLY | BY SECURITY | | |
| | | PROVIDER | | |
| 1 | CARD READER | BY SECURITY | | |
| | | PROIVDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #13

DOORS: 105

| 1 | HINGE | 662HD LAR | BK | BES |
|---|-----------------|--------------------|-----|-----|
| 1 | STOREROOM LOCK | 9K 3 0 D 16 K | 626 | BES |
| 1 | ELECTRIC STRIKE | 4104 (FAIL SECURE) | 32D | RCI |
| 1 | DOOR CLOSER | 89 16 IS FC SN1 | 689 | DKA |
| 1 | DOOR POSITION | 9540 | В | RCI |
| | SWITCH | | | |
| 1 | POWER SUPPLY | BY SECURITY | | |
| | | PROVIDER | | |
| 1 | CARD READER | BY SECURITY | | |
| | | PROVIDER | | |
| 1 | GASKETING/MUTES | BY ALUM DR. MFG. | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #14

DOORS: 203B, 203C

| 6 | HINGE | FBB168 45X45 (NRP AS | 26D | BES |
|--------|----------------------------|--|-------------|-------------|
| 2 2 | EXIT DEVICE DOOR CLOSER | REQ'D) 2214 LBR 4914 B 89 16 SDST FC SN1 | 626W 689 | PRE DKA |
| 2 | KICK PLATE | K0050 12" X 1" LDW CSK B4E | 630 | TRI |
| 2 | SILENCER | 1229A | GRAY | TRI |
| | SET #15 | | | |
| | | | | |
| | DOORS: 105A, 113 | | | |
| 3 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
| 1 | MORTISE LOCK | 45H L 15 H VIB | 626 | BES |
| 1 | OVERHEAD STOP | 700 S SERIES | 626 | DK |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK | 630 | TRI |
| 1 | MOP PLATE | B4E KM050 12" X 1" LDW CSK B4E | 630 | TRI |
| TRF | D2302 | 087100 - 27 | | Issue Date: |

| 3 | SILENCER | 1229A | GRAY | TRI |
|------------------|---|---|---------------------------|--------------------------|
| | SET #16 | | | |
| | DOORS: 101, 103, 207, 209 | 9 | | |
| 3 | HINGE | FBB168 45X45 (NRP AS | 26D | BES |
| 1 1 1 1 | PUSH/PULL PLATE FOOT PULL DOOR CLOSER KICK PLATE | REQ'D) 1895 4B UFP 89 16 IS FC SN1 K0050 12" X 2" LDW CSK | 630 316S 689 630 | TRI TRI DKA TRI |
| 1 | MOP PLATE | B4E KM050 12" X 1" LDW CSK | 630 | TRI |
| 3 | SILENCER | B4E 1229A | | |
| | SET #17 | | | |
| | DOORS: 102A | | | |
| 3 | HINGE | FBB168 45X45 (NRP AS | 26D | BES |
| 1 1 1 | PASSAGE SET DOOR CLOSER KICK PLATE | REQ'D) 9K 3 0 N 15 D PATD 89 16 SDST FC SN1 K0050 12" X 2" LDW CSK | 626 689 630 | BES DKA TRI |
| 3 | SILENCER | B4E 1229A | GRAY | TRI |
| | SET #18 | | | |
| | DOORS: 100E, 203A | | | |
| 3 | HINGE | FBB168 45X45 (NRP AS | 26D | BES |
| 1 1 1 | EXIT DEVICE DOOR CLOSER KICK PLATE | REQ'D) 2114 4914 B 89 16 IS FC SN1 K0050 12" X 2" LDW CSK | 626 W 689 630 | PRE DKA TRI |
| 1 | GASKETING | B4E 5075 HEAD & JAMBS (2) | С | NGP |
| | SET #19 | | | |
| | DOORS: 100D, 100F, 110 | | | |
| 3 | HINGE | FBB168 45X45 (NRP AS | 26D | BES |
| 1 1 1 1 | EXIT DEVICE ELECTRIC STRIKE DOOR CLOSER KICK PLATE | REQ'D) 2103 4903 B 0162 (FAIL SECURE) 89 16 IS FC SN1 K0050 12" X 2" LDW CSK B4E | 626W 32D 689 630 | PRE RCI DKA TRI |
| TRF | D2302 | 087100 - 28 | | Issue Date |

| 1 | GASKETING | 5075 HEAD & JAMBS (2) | С | NGP |
|---|-------------------------|-----------------------|---|-----|
| 1 | DOOR POSITION SWITCH | 9540 | В | RCI |
| 1 | POWER SUPPLY | BY SECURITY | | |

1 CARD READER PROVIDER PROVIDER BY SECURITY PROVIDER

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #20

DOORS: 111, 118A

| 3 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|-------------------------|--------------------------------|------|-----|
| 1 | EXIT DEVICE | 2103 FL 4903 B | 626W | PRE |
| 1 | ELECTRIC STRIKE | 0162 (FAIL SECURE) | 32D | RCI |
| 1 | DOOR CLOSER | 89 16 IS FC SN1 | 689 | DKA |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK B4E | 630 | TRI |
| 1 | GASKETING | 5075 HEAD & JAMBS (2) | С | NGP |
| 1 | DOOR SHOE | 12T LAR | US27 | NGP |
| 1 | DOOR POSITION SWITCH | 9540 | В | RCI |
| 1 | POWER SUPPLY | BY SECURITY PROVIDER | | |
| 1 | CARD READER | BY SECURITY PROVIDER | | |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #21

DOORS: 200A

| 3 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
|---|-------------------------|--------------------------------|------|-----|
| 1 | EXIT DEVICE | 2114 4914 B | 626W | PRE |
| 1 | DOOR CLOSER | 89 16 AF89 FC SN1 | 689 | DKA |
| 1 | KICK PLATE | K0050 12" X 2" LDW CSK B4E | 630 | TRI |
| 1 | MAGNETIC DOOR HOLDER | EM 500 SERIES | 689 | DKA |
| 1 | GASKETING | 5075 HEAD & JAMBS (2) | С | NGP |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY HELD OPEN VIA MAGNETIC HOLDER. FIRE ALARM ACTIVATION WILL RELEASE MAGNETIC HOLD AND ALLOW DOOR TO CLOSE AND LATCH. COORDINATE ALL WIRING AND INSTALLATION WITH **DIVISIONS 26 & 28.**

SET #22

DOORS: 200B

| HINGE | FBB168 45X45 (NRP AS | 26D | BES |
|---------------|---|--|--|
| | , | 630 | TRI |
| NORTEATE | B4E | 000 | |
| ASTRAGAL | 9115 SET LAR | Α | NGP |
| EXIT DEVICE | 2214 FL LBR 4914 B | 626W | PRE |
| DOOR CLOSER | 89 16 AF89 FC SN1 | 689 | DKA |
| MAGNETIC DOOR | EM 500 SERIES | 689 | DKA |
| HOLDER | | | |
| GASKETING | 5075 HEAD & JAMBS (2) | С | NGP |
| | KICK PLATE ASTRAGAL EXIT DEVICE DOOR CLOSER MAGNETIC DOOR HOLDER | KICK PLATEREQ'D) K0050 12" X 1" LDW CSK B4EASTRAGAL9115 SET LAREXIT DEVICE2214 FL LBR 4914 BDOOR CLOSER89 16 AF89 FC SN1MAGNETIC DOOREM 500 SERIESHOLDERHOLDER | KICK PLATEREQ'D) K0050 12" X 1" LDW CSK630 B4EASTRAGAL9115 SET LARAEXIT DEVICE2214 FL LBR 4914 B626WDOOR CLOSER89 16 AF89 FC SN1689MAGNETIC DOOREM 500 SERIES689HOLDER689689 |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOORS NORMALLY HELD OPEN VIA MAGNETIC HOLDER. FIRE ALARM ACTIVATION WILL RELEASE MAGNETIC HOLD AND ALLOW DOORS TO CLOSE AND LATCH. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #23

DOORS: 115A

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE LEVER TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

SET #24

DOORS: 201B

New Fire Headquarters

| 3 | DOUBLE ACTING | 1001 5" | 26D | MCK |
|---|--------------------------------------|--------------------------------|-----|---|
| 2 | SPRING HINGE KICK PLATE | K0050 12" X 2" LDW CSK B4E | 630 | TRI |
| 2 | PUSH PLATE | 1001 SERIES | | |
| | SET #25 | | | |
| | | | | |
| | DOORS: 122A | | | |
| 3 | HINGE | FBB168 45X45 (NRP AS REQ'D) | 26D | BES |
| 1 | STOREROOM LOCK | 9K 3 7 D 15 D PATD | 626 | BES |
| 1 | ELECTRIC STRIKE | 4104 F (FAIL SECURE) | 32D | RCI |
| | D2302 Ils Roseville Fire District | 087100 - 30 | I | lssue Date: 02-25-2025 2/25/2025 4:18 PM |

OPERATIONAL DESCRIPTION: FREE EGRESS ALWAYS. DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIALS AT READER WILL ELECTRICALLY RELEASE THE STRIKE TO ALLOW ENTRY. DOOR POSITION SWITCH MONITORS DOOR STATUS. DOOR WILL REMAIN CLOSED AND LOCKED DURING POWER OUTAGE. COORDINATE ALL WIRING AND INSTALLATION WITH DIVISIONS 26 & 28.

END OF SECTION

H2M

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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Glazed curtain walls.
 - 2. Storefront framing.
 - 3. Glazed entrances.
 - 4. Interior borrowed lites.
 - 5. Window Glazing.
 - 6. Door Glazing.

1.03 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: 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 <u>or</u> 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.

1.04 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, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - b. Basic Wind Speed: 128 mph.
 - c. Risk Category: IV.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. 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.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the 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 deg F (49 deg C), ambient; 180 deg F (82 deg C), material surfaces.
- D. ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missle(s) and Exposed to Cyclic Pressure Differentials. ASTM E1996 augments ASTM E1886 by specifying the weight of the large missile to be used in testing per ASTM E1886 and the impact velocities for the large and small missiles. The ASTM standards identify more stringent requirements for buildings in higher basic wind speed zones and for critical facilities. Table 10-1 presents two ASTM E1996 large missile requirements for different wind zones and building classifications.

1.05 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Tinted glass.
 - 2. Fire-resistive glazing products.
 - 3. Insulating glass.
 - 4. Spandrel glass.
- C. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass 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 installers manufacturers of insulating-glass units with sputter-coated, low-e coatings glass testing agency and sealant testing agency.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass coated glass insulating glass glazing sealants and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain tinted float glass coated float glass laminated glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (232 deg C), and the fire-resistance rating in minutes. Fire resistance rated assemblies must be tested in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 084113 Aluminum-Framed Entrances and Storefronts. and Section 084413 Glazed Aluminum Curtain Walls, as applicable, to match glazing systems required for Project, including glazing methods.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined 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.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.01 GLASS PRODUCTS, GENERAL
 - 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. Where heat-treated glass is indicated; provide heat-strengthened float glass, ASTM C1048, Kind HS or Tempered, ASTM C1048, Kind FT, fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes enhanced-protection testing requirements in ASTM E1996 for Wind Zone 3 when tested according to ASTM E1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

- 1. Large-Missile Test: For all glazing, regardless of height above grade.
- D. 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 as 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. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- B. 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 with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cardinal Glass Industries; LoE2 Plus
 - b. Pilkington North America; Activ
 - c. Vitro Architectural Glass Industries, Inc.; SunClean
- C. Tinted Float Glass: Class 2, complying with other requirements specified.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide glass by Vitro Architectural Glass or comparable product by one of the following:
 - a. Vitro Architectural Glass.
 - b. Guardian Industries.
 - 2. Tint Color: As selected by the Architect.
- D. Spandrel Glass: ICD OPACI-COAT-300 Silicone Opacifier coating: ASTM C1048, Kind FT, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass or comparable product by one of the following:
 - 2. Guardian Glass Products.
 - 3. Pilkington North America.
 - 4. Spandrel Coating Color: As selected by the Architect.

2.03 LAMINATED GLASS

A. Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose 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 warm edge spacer material and construction .
 - 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- B. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.05 FIRE-PROTECTIVE GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.
- B. Monolithic Ceramic Glazing: Clear, ceramic flat glass composed of glazing and fire-rated surface applied film, impact safety-rated glazing material, 3/16-inch (5-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. TGP; Firelite NT
 - b. McGrory Glass; Schott Pyran Platinum F
 - c. Vetrotech Saint-Gobain; Keralite Select FR-F (Safety Film)
- C. Laminated Fire-Rated (20 to 180 minutes), High Impact Safety-Rated Ceramic Glass, Ultra-HD technology, 5/16 inch thickness meeting CPSC 16 CFR 1201 (Cat. I and II) and ANSI Z97.1, withstands thermal shock. 5-year limited warranty. Surface Grade Standard.
 - 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. TGP Firelite Plus
 - b. McGrory Glass; Pyran Platinum L
 - c. Verotech Saint-Gobain; Keralite Select FR-L
 - d. Architect approved equivalent.

2.06 FIRE-RESISTANCE RATED GLAZING

- A. Multi-laminate Fire-Rated (45 to 120 minutes), Impact Safety-Rated Fireglass multi-laminate glass with clear intumescent interlayers, interior and exterior use, meets CPSC 16 CFR 1201 (Cat. I and II) and ANSI Z97.1 and providing protection against radiant and conductive heat transfer as per ASTM E119 and UL 263, withstands thermal shock. 5-year limited warranty.
 - 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. Pilkington Pyrostop: 45-200: 45 min., 3/4 inch thick, STC 40, U-Value .86.
 - b. AGC Pyrobel by McGrory Glass: 45-120: 45 min., 3/4 inch thick.

- c. Architect approved equivalent.
- B. Fire-rated glazed assemblies requiring compliance to ASTM E119: Glazing shall be Pilkington PyroStop; AGC Pyrobel by McGrory Glass or approved equal. Glazing shall be Clear, laminated fully insulating fire and impact-resistant glass or as selected by the Architect.

2.07 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C864.
 - 2. EPDM complying with ASTM C864.
 - 3. Silicone complying with ASTM C1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.08 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealants used inside 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."
 - 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - 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. Dow Corning Corporation; 795
 - b. GE Advanced Materials Silicones; SilPruf LM SCS2700
 - c. Pecora Corporation; 890
 - d. Sika Corporation, Construction Products Division; SikaSil-C990
 - e. Tremco Incorporated; Spectrem 1
- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.09 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.11 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.12 MONOLITHIC-GLASS TYPES

- A. Glass Type MG-1 Clear fully tempered float glass.
 - 1. Thickness: 1/4 inch (6.0 mm) and 3/8 inch (9.53 mm) as indicated on the drawings.
 - 2. Provide safety glazing labeling.

2.13 INTERIOR LAMINATED-GLASS TYPES

- A. Glass Type ILG-1: Clear laminated glass with two plies of fully tempered float glass with etched surface pattern.
 - 1. Thickness of Each Glass Ply: 0.118 inch (3.0 mm).
 - 2. Interlayer Thickness: 0.090 inch (2.29 mm).
 - 3. Provide safety glazing labeling.
 - 4. Provide acid-etched banding as indicated on the drawings.
- B. Glass Type ILG-2: Fire-rated laminated glass
 - 1. Thickness: 8.0 mm.
 - 2. Provide safety glazing label- CSPC 16 CFR 1201 Cat. I and II.
 - 3. Manufacturer: TGP Firelite Plus; McGrory Glass Pyran Platinum L or Architect approved equivalent.

2.14 INSULATING GLASS TYPES

- A. Exterior Glass Type EIG-1: Low-E coated, insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Exterior Glass Lite: 1/4 inch tempered Solarban 60 Low-E (2) Optigray glass.
 - 3. Interspace Content: Air (5%) / Argon (95%).
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Glass Lite: 1/4 inch tempered StarPhire glass
 - 6. Visible Light Transmittance: 50 percent minimum.
 - 7. Winter Nighttime U-Factor: 0.24 maximum.
 - 8. Solar Heat Gain Coefficient:0.30 maximum.
- B. Glass Type EIG-2: Spandrel Glass ICD OPACI-COAT-300 Silicone Opacifier coating, Low-E, insulating spandrel glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Thickness of Exterior Glass Lite: 1/4 inch fully tempered Solarban 60 (2) Optigray glass.
 - 3. Interspace Content: Air (12%) / Argon (22%) / Krypton (66%) Mix.
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Lite: 1/4 inch fully tempered Clear with ICD OPACI-COAT-300 Silicone Opacifier coating (4).
 - 6. Opacifier Color: ICD 3-4094 Graylights or as selected by the Architect to match glazing system.
 - 7. Winter Nighttime U-Factor: 0.24 maximum.

2.15 EXTERIOR LAMINATED INSULATING GLASS TYPES

- A. Glass Type ELIG-3: Low-E-coated, insulating glass.
 - 1. Overall Unit Thickness: 1.34 (with 0.090 PVB interlayer 1/4" glass).
 - 2. Exterior Glass Lite: 1/4 inch tempered Solarban 60 Low-E (2) Optigray glass.
 - 3. Interspace Content: Air (5%) / Argon (95%).
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Glass Lite: 1/4 inch heat strengthened Clear 0.060 inch Clear PVB 1/4 inch heat strengthened.

- 6. Visible Light Transmittance: 50 percent minimum.
- 7. Winter Nighttime U-Factor: 0.24 maximum.
- 8. Solar Heat Gain Coefficient: 0.30 maximum.
- 9. Provide safety glazing labeling.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.
- 3.03 GLAZING, GENERAL
 - A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
 - B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
 - C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
 - D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
 - E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 - F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and

glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

- 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at

corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass mirrors.
 - 1. Tempered safety glass.

1.02 REFERENCE STANDARDS

- A. ASTM C920 Standard Specification for Elastomeric Joint Sealants; 2018.
- B. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- C. ASTM C1193 Standard Guide for Use of Joint Sealants; 2016.
- D. ASTM C1503 Standard Specification for Silvered Flat Glass Mirror; 2024.
- E. GANA (GM) GANA Glazing Manual; 2008.
- F. GANA (SM) GANA Sealant Manual; 2008.

1.03 SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples, 6 x 6 inch (<u>x</u> mm) in size, illustrating mirrors design, edging, and coloration.
- E. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure that 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 016100 BASIC PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.1. Maintain one copy on project site.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.
- 1.05 FIELD CONDITIONS
 - A. Do not install mirrors when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 017800 CLOSEOUT SUBMITTALS, for additional warranty requirements.
- B. Provide ten year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mirrors:
 - 1. Trulite Glass and Aluminum Solutions; ScarGard: www.trulite.com.
 - 2. Binswanger Mirror/ACI Distribution: www.binswangerglass.com.
 - 3. Lenoir Mirror Co: www.lenoirmirror.com.
 - 4. Dunlea Glass & Mirrorwww.dunleaglass.net.
 - 5. Substitutions: See Section 012500 PRODUCT SUBSTITUTION PROCEDURES.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass; Type 1: Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 3/16 inch (4.8 mm).
 - 2. Beveling: None.
 - 3. Size: As noted on drawings.

2.03 GLAZING COMPOUNDS

- A. Manufacturers:
 - 1. Tremco.
 - 2. Pecora.
 - 3. Gunther.
- B. Silicone Sealant; Type : ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; color as selected.

2.04 ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.
- C. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- D. Glazing Clips: Manufacturer's standard type.

- E. Mirror Attachment Accessories: Stainless steel clips.
- F. Mirror Primer: Primer and sealer to promote adhesion to substrate surfaces. Environmentally safe.
 - 1. Product: Gunther Prime-N-Seal or approved equal.
- G. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.1. Product: Gunther Premier, Low VOC mirror mastic or approved equal.
- H. Mirror Edge Seal: Protective edge seal for mirror edges.1. Manufacturer: Gunther Seal-Kwik or approved equal.
- I. Rolled Formed Frame: One piece, roll-formed angle frame, stainless steel, Type 430, satin finish, with welded frame corners, ground and polished smooth.
- J. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep (12.7 mm by 12.7 mm by 9.5 mm deep) with 90 degree mitered corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.
- 3.02 PREPARATION
 - A. Clean contact surfaces with solvent and wipe dry.
 - B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
 - C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Installation in Frames:
 - 1. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
 - 2. Rest mirrors on setting blocks and push against tape to ensure full contact at perimeter of mirror.
 - 3. Install removable stops, insert spacer shims between mirrors, and apply stops at 24 inch (600 mm) on center and at 1/4 inch (6 mm) below sight line.

5. Trim protruding tape edge.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

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 Interior Architectural Window Film.
- B. Related Sections include the following:
 - 1. Section 088000 Glazing

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASHRAE American Society for Heating, Refrigeration and Air Conditioning Engineers; Handbook of Fundamentals.
- C. ASTM International (ASTM):
 - 1. ASTM E 84 Standard Method of Test for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E 308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
 - 3. ASTM E 903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

1.04 PERFORMANCE REQUIREMENTS

- A. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
 - 1. Flame Spread Index: no greater than 25.
 - 2. Smoke Developed Index: no greater than 450.

1.05 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements.
- C. Product Data: Manufacturer's current technical literature on each product to be used, including:
 - 1. Manufacturer's Data Sheets.
 - 2. Preparation Instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- D. Verification Samples: For each film specified, two samples representing actual film color and pattern.
- 1.06 QUALITY ASSURANCE
 - A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years' experience.

- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
 - 2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
 - a. Name of Building.
 - b. The name and telephone number of a management contact.
 - c. Type of glass.
 - d. Type of film and/or film attachment system.
 - e. Amount of film and/or film attachment system installed.
 - f. Date of completion.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Pursuant to manufacturer's published instructions.
- B. Protect against moisture exposure and damage.
- C. Store products in manufacturer's unopened packaging until ready for installation.

1.08 ENVIRONMENTAL 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 WARRANTY
 - A. At project closeout, provide to Owner or Owner's Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
 - B. In order to validate warranty, installation must be performed by an Authorized dealer and according to Manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. SOLYX IQ, A subsidiary of Decorative Films, LLC, Frederick, MD 21703. Phone: (888) 657-5224
 - 2. 3M™
 - 3. Go Graphix, 31 Benton Drive East, Longmeadow, MA 01028. Phone: (413) 525-2244
 - 4. Architect Approved Equivalent.

2.02 WINDOW FILM

- A. WF-1 3M[™] Crystal Glass Finish Window Film
 - 1. Product: #7725SE-314, Dusted Crystal.
 - 2. Thickness 3.2 mils.
 - 3. Locations: Interior Storefronts and Vision Lites on Doors 203B and 203C.

- B. WF-2 3M[™] Scotchcal[™] Graphic Film, White
 - 1. Product: #3650-10, White
 - 2. Thickness: 2 mils.
 - 3. Location: Address Signage on Front Entry Curtainwall.

2.03 PATTERN AND LOCATIONS

- A. See contract drawings for glazing requiring each different type of window film.
- B. Window film sizes and patterns as shown on Contract Drawings.
- C. Install edge to edge with no gaps.
- D. Film Location:
 - 1. Interior Glazing: Film to be applied on the outboard side of glazing (i.e. corridor or larger room size).
 - 2. Exterior Glazing: Film to be applied on the interior side of glazing.

PART 3 EXAMINATION

3.01 EXAMINATION

- A. Film Examination:
 - 1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
 - 2. Do no proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
 - 3. Commencement of installation constitutes acceptance of 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 results for the substrate under the project conditions.

3.03 INSTALLATION

- A. Film Installation, General:
 - 1. Install in accordance with manufacturer's instructions.
 - 2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
 - 3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
 - 4. Apply film to glass and lightly spray with slip solution.
 - 5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
 - 6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

- 7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
- 8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

3.04 CLEANING AND PROTECTION

- A. Remove left over material and debris from work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Do not clean until Thirty (30) days after the installation date.
- D. After application of film, wash film in accordance with manufacturer's recommendations. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

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. Fixed louvers, frames and accessories.

1.03 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).
- D. Drainable-Blade Louver ASTM E330/E330M: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.
- D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.07 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
 - 2. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
- C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet (9.1 m) of grade shall pass enhanced-protection, large-missile testing requirements in ASTM E1996 for Wind Zone 3 when tested according to ASTM E1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.
- D. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
- G. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.03 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Wind-Driven-Rain-Resistant Louver:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Airolite Company, LLC (The):
 - b. Arrow United Industries; a division of Mestek, Inc
 - c. Construction Specialties, Inc
 - d. Greenheck Fan Corporation
 - e. Nystrom, Inc.

- f. Ruskin Company; Tomkins PLC.
- 2. Louver Depth: 4 inches (K6744X).
- 3. Blade Angle: 35 degrees.
- 4. Drainable Blades (ASTM E330/E330M)
- 5. Frame and Blade Nominal Thickness: Not less than 0.081 inch.
- 6. Louver Performance Ratings:
 - a. Free Area: Not less than 8.92 (K6744X) sq. ft. for 48-inch wide by 48-inch high louver.
 - b. Air Performance: Not more than 0.10-inch wg static pressure drop at 800-fpm free-area intake velocity.
 - c. Wind-Driven Rain Performance: Not less than 95 percent effectiveness when subjected to a rainfall rate of 8 inches per hour and a wind speed of 50 mph at a core-area intake velocity of 989 fpm (K6744X).
 - d. Maximum Qualified Wind design Load: +/- 200 PSF
- 7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.04 LOUVER SCREENS

- A. General: Provide screen as manufactured by the Louver manufacturer on the interior face of each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Provide and install Bird screening except where Insect screening is indicated.
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert.
- D. Louver Screening for Aluminum Louvers:
 - 1. Insect Screening: Stainless steel, 18 by 18 mesh, 0.009-inch wire.

2.05 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T5, T-52, or T6.
- B. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.06 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
 - 2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with mullions at corners.
- G. Provide subsills made of same material as louvers or extended sills for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.07 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. 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.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. 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.

3.04 ADJUSTING AND CLEANING

- A. 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.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction 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.
 - 1. 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

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: Gypsum board shaft wall assemblies
- B. Chase Enclosures.

1.03 ACTION SUBMITTALS

- A. Submit manufacturers' product information, specifications, and installation instructions for the specified products including, GWB, joint compounds, fasteners, trim, control joints, joint reinforcing, metal furring members, metal studs, tracks, runners, bridging, resilient channels, steel grounds, and all related accessories.
- B. Product Data: For each component of gypsum board shaft wall assembly.

1.04 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies firestop tracks, from ICC-ES.
- B. Test Reports:
 - 1. For all stud framing products that do not comply with ASTM C645 or C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
 - Acoustical Test Report: provide acoustical test report from a qualified testing agency indicating the Noise Barrier meets a STC value of at least 25 per ASTM E90 and ASTM E413.

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. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- D. Single-Source Responsibility for Finishing Materials: Obtain finishing materials either from the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- E. Fire-Test-Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
 - 1. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

- 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- 3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Noise Barrier Manufacturer Qualifications:
 - 1. Manufacturer shall have a minimum of five (5) years experience in the production of specified products and shall furnish supporting documentation showing completed jobs of approximately the same size and scope. Provide Owner and Architect contact information for all projects listed.

1.06 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.
- B. Stack panels flat and supported on risers on a flat platform to prevent sagging.
- C. Noise barrier: Protect Noise Barrier material from excessive moisture when shipping, storing, and handling. Deliver unopened skids and store in a dry place with adequate air circulation. Do not deliver material until that portion of the building requiring noise barrier installation is enclosed and weathertight.

1.07 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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.

2.02 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. Gypsum Board and Related Products
 - a. CertainTeed
 - b. G-P Gypsum Corp.
 - c. National Gypsum Company
 - d. USG Corporation.
 - 2. Steel Framing and Furring

- a. ClarkDietrich Building Systems
- b. National Gypsum Company
- c. United States Gypsum Company
- d. Marino/Ware: a Division of Ware Industries, Inc.
- 3. Noise Barrier
 - a. DDS Acoustical Specialties, 43 Mainline Drive, Westfield, MA 01085. Phone: 413-248-8118.
 - b. Architect approved equivalent.

2.03 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated.
- B. Studs: Manufacturer's standard E, H and C-H profiles for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated 2-1/2 inches (64 mm).
 - 2. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
- C. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.
 1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
- D. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.
- E. Room-Side Finish: Gypsum board.
- F. Shaft-Side Finish: Gypsum shaftliner board, moisture-and mold-resistant Type X.
- G. Insulation: Sound attenuation blankets.

2.04 PANEL PRODUCTS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Gypsum Shaftliner Board, Type X or C as required by UL Assembly: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.
- C. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X or C as required by UL Assembly: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
 - b. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
 - c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.
 - 2. Thickness: 1 inch (25.4 mm).
 - 3. Long Edges: Double bevel.
 - 4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
- D. Gypsum Board: As specified in Section 092900 GYPSUM BOARD

2.05 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C645 requirements for metal unless otherwise indicated.

- 1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653/A653M, G40 (Z120) ASTM A653/A653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- B. 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.

2.06 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
- E. Sound Attenuation Blankets: As specified in Section 092900 GYPSUM BOARD.
- F. Acoustical Sealant: As specified in Section(s) 092900 GYPSUM BOARD and 079200 JOINT SEALANTS .

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 APPLIED FIRE PROTECTION.
- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.03 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturers written installation instructions, and ASTM C754 other than stud-spacing requirements.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints at locations indicated on Drawings while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.04 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- 3.05 LEVEL OF FINISH
 - A. Surfaces to receive tile, surfaces to receive fire taping, and/or surfaces not exposed to view, shall be finished to a minimum of AWCI Level 2.

- B. Surfaces to receive heavy textured finish or heavy grade wall covering shall be finished to a minimum of AWCI level 3.
- C. Surfaces to receive paint or light grade wall coverings shall be finished to a minimum of AWCI level 4.
- D. Surfaces to receive gloss, semi-gloss, or egg shell paint shall be finished to a minimum of AWCI level 4.
- E. Level 5 finish only required in locations specifically noted on the contract drawings. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES

- A. Maximum variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.
- 3.07 WASTE MANAGEMENT
 - A. Plan and coordinate work to minimize generation of off-cuts and waste. Sequences work to maximize use of GWB off-cuts and waste.
- 3.08 CLEANING AND REPAIR
 - A. Clean all excess materials each day. Promptly remove any residual joint compound from adjacent surfaces.
 - B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion.
 - C. Repair damaged work prior to Punch List

END OF SECTION

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. Partial Wall Framing Supports.
 - 4. Adjustable Aluminum Mullion/Partition Closures.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

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. 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.
- B. 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: 18 gauge (0.043 inch) and 20 gauge (0.033 inch) as indicated on the drawings.
 - 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: 20 gauge (0.027 inch).
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 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.
- 3) Marino/Ware; Slotted Track SLT
- D. 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.
- E. 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.
- F. 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.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C645.
 - 1. Minimum Base-Metal Thickness: 20 gauge (0.033 inch).
 - 2. Depth: 7/8 inch, 1-1/2 inches as indicated on the drawings.
- H. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical.
 - 2. Manufacturer: Clark- Dietrich; Model RCSD or Architect approved equal.
- I. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 16 gauge (0.057 inch) gauge, and depth required to fit insulation thickness indicated.
- J. 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 (0.054 inch) uncoated-steel thickness, with minimum 1 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. Partial Wall Framing Supports: Pony Wall Heavy (PW) framing supports for partial height cantilever wall systems unsupported at the top track utilizing 12 gauge (0.107 inch thick) stud members, Structural Grade 50 (50 ksi minimum yield strength), ASTM A653 and ASTM A1003. Moment of Inertia: 0.7739 inches^4 for deflection design. Integral Heavy Base Plate; 12 inch thick, ASTM A36 (36 ksi minimum yield strength, 8 inch long x 3 3/8 invh wide x 1/2 inch thick plate with five bolt hole locations spaced per manufacturer to accept 1/2 inch diameter Hilti Kwik Bolt-3 in quantities indicated on the drawings. Manufacturer: Clark-Dietrich or Architect approved equivalent.
 - 1. Model(s): PW24 (23 3/4 inches long), PW36 (35 3/4 inches long), and PW48 (47 3/4 inches long) as indicated.
- D. Adjustable Aluminum Mullion/Partition Closures: MULLION MATE PRO 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 5: 5 inch through 6 15/16 inch or as required by the field conditions.
 - b. Length: 14 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.
 - 5. Curved Partitions:

- a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
- b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- c. Products such as Curv-Trak and Flex-C Trac may be submitted for approval to accomplish radius wall applications.
- 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 ASPHALT SHINGLES, 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

1.01 SUMMARY

- A. Description of Work: Work of this section includes, but is not limited to, the following:
 - 1. Metal suspension systems
 - 2. Sound-rated construction and accessories

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions with project conditions and materials clearly identified or detailed for each required system.

1.03 SYSTEM REQUIREMENTS

- A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
 - 1. Gypsum board partitions:
 - a. Standard systems: Maximum deflection of L/240 of partition height.
 - b. Systems to receive water resistant gypsum board or backer board: Maximum deflection of L/360 of partition height.
 - 2. Cavity shaftwall systems: Withstand minimum positive and negative pressure of 5 psf.
 - 3. Interior suspended ceilings and soffits: Maximum deflection of L/360 of distance between supports.
 - 4. Exterior soffits: Withstand minimum positive and negative pressure of 20 psf with maximum deflection of L/360 of distance between supports.
- B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
- C. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90.

1.04 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. Applicable requirements of ASTM C754 for installation of steel framing.
 - 2. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board" except for more stringent requirements of manufacturer.
 - 3. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Deliver material to site promptly without undue exposure to weather.
 - 2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- B. Storage:
 - 1. Store above ground in dry, ventilated space.
 - 2. Protect materials from soiling, rusting and damage.
 - 3. Store board to be directly applied to masonry walls at 70°F for 24 hours prior to installation.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install gypsum board when ambient temperature is below 40°F.
 - 2. For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55°F from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.

1.07 ALTERNATE CONSTRUCTION WASTE DISPOSAL

- A. Reuse:
 - 1. Separate clean waste drywall pieces from contaminants for landfilling or recycling. Do not include vinyl-faced, mold-resistant or asphalt impregnated gypsum boards. Pulverize and apply to site soil in accordance to landscape specifications. Protect scrapes and pulverized material from moisture and contamination. Alternate to on-site soil amendment, work to supply local farming granular material for their use.
- B. Recycle:
 - 1. Separate clean waste drywall pieces from contaminants for landfilling or reuse. Working with local waste hauler and local drywall manufacturer, provide proper storage of waste for pickup and return. Protect scrapes material from moisture and contamination.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

- A. Gypsum Board and Accessories: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.
- B. Steel Framing and Furring: Company acceptable to installer.
- C. Grid Suspension Assemblies: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.

2.02 BOARD MATERIALS

A. Gypsum Board: See Section 092900 - GYPSUM BOARD.

2.03 METAL FRAMING AND FURRING MATERIALS

- A. Metal Studs and Runners:
 - 1. ASTM C645, "C" shaped, gauge:
 - a. Provide 25 gauge studs, except as otherwise indicated or specified. Provide heavier gauge as required / indicated on the drawings.
 - b. At door and borrowed light frames, provide (2) 25 gage minimum studs at each jamb. Where wall is indicated or specified to be typically framed with 20 gauge studs, provide (2) 20 gauge studs at each jamb.
 - c. Provide 20 gauge studs at walls to receive cement backer board with ceramic tile facing.
 - d. Provide runner gauge as recommended by stud manufacturer.
 - e. Depth of sections: As indicated.
 - f. Corrosion protection: G40 hot-dipped galvanized coating per ASTM A525.
- B. Shaft Wall Supports:

- 1. Conform to ASTM A446, Grade A, with G40 hot-dipped galvanized coating per ASTM A525.
- 2. Studs:
 - a. Shape: "CH", "J" or "E" or as standard with manufacturer.
 - b. Gauge: As required to fulfill performance criteria, minimum 25 gauge. Provide 20 gauge for jamb and lintel components.
 - c. Size: As indicated.
 - d. J runners: 24 gauge, size as required for coordination with studs.
 - e. Jamb struts: 20 gauge with 3 inch back leg for use at elevator frames.
- C. Metal Furring Channels:
 - 1. Hat-shaped:
 - a. ASTM C645, 7/8 inch high, 25 gauge, with G40 hot-dipped galvanized coating per ASTM A525.
 - b. Provide 20 gauge at furring to receive tile backer board.
 - c. Acceptable products: DWC-25 for 1/2" and 5/8" gypsum board and DWC-20 by USG.
 - 2. Z-shaped: ASTM C645, depths as indicated, 24 gauge minimum, with G40 hot-dipped galvanized coating per ASTM A525.
 - 3. Resilient: Manufacturer's standard type designed to reduce sound transmission; ½ inch deep, 25 gauge steel with G40 hot-dipped galvanized coating per ASTM A525.
- 2.04 CEILING AND SOFFIT SUPPORT MATERIALS
 - A. Hanger Anchorage Devices: Screws, clips, bolts or other devices compatible with indicated structural anchorage for ceiling hangers and whose suitability has been proven through standard construction practices or by certified test data.
 - B. Powder-Actuated Fasteners in Concrete: Fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers and with capability to sustain, without failure, a load equal to 10x calculated loads.
 - C. Post-tensioned Concrete Slabs:
 - 1. For inserts placed in post-tensioned concrete work, maintain 3 inch clearance between inserts and prestressing strands.
 - 2. If insert is in conflict with strand, insert must be moved to avoid strand. Do not move strands to avoid inserts.
 - D. Hangers:
 - 1. Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
 - 2. Wire: ASTM A641/A641M, soft, Class 1 galvanized.
 - 3. Rods and flats:
 - a. Mild steel components.
 - b. Finish: Galvanized or painted with rust-inhibitive paint for interior work; galvanized for exterior work.
 - E. Framing System:
 - 1. Main runners:
 - a. Cold-rolled, "C" shaped steel channels, 16 gauge minimum.
 - b. Finish: Galvanized with G40 hot-dip galvanized coating per ASTM A525 for exterior work; galvanized or painted with rust-inhibitive paint for other interior work.
 - c. Form to required radius at curved ceilings.
 - 2. Cross furring: Hat-shaped steel furring channels, ASTM C645, 7/8 inch high, 25 gauge, galvanized.

- 3. Furring anchorages: 16 gauge galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails or screws recommended by furring manufacturer and complying with ASTM C754.
- 4. Provide compression posts and other accessories as required to comply with seismic requirements.
- F. Proprietary Framing System:
 - 1. Framing system for gypsum board panels consisting of cold-rolled steel members conforming to ASTM C635/C635M, with exposed surfaces finished in manufacturer's standard enamel paint finish.
 - 2. Fire rating: 1 and 2 hour rating in accordance with UL assembly indicated.
 - 3. Components: Main tees, furring cross channels, furring cross tees, and cross tees.
 - 4. Accessories:
 - a. U-shaped channel molding.
 - b. Galvanized carbon steel (12 ga.) hanger wire.
 - c. Acceptable product: Equivalent to Drywall Suspension System by USG.

2.05 ACCESSORIES

- A. Metal Trim for Gypsum Board: See Section 092900 GYPSUM BOARD.
 - 1. Conform to profile and dimensions indicated.
 - 2. Material for interior work: Galvanized steel, 26 gauge minimum.
 - 3. Corner beads
 - 4. Casing beads (edge beads):
 - 5. Control joints:
 - a. Roll-formed zinc with perforated flanges.
 - b. Size: 1-3/4 inch wide, with 1/4 inch wide center channel.
 - c. Provide with removable tape strip over channel.
- B. Paper-Faced Metal Trim for Gypsum Board:
 - 1. Conform to profile and dimensions indicated.
 - 2. Material for interior work: Comply with ASTM C1047.
- C. Trim for Exterior Soffits: Rolled zinc complying with ASTM C1047.
- D. Special Trim and Reveals: Extruded aluminum alloy 6063-T5, profiles as indicated.
- E. Backer Plates:
 - 1. Steel, galvanized; 6 inches wide x 16 gauge minimum x lengths to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
 - 2. Elimination of backer plates or direct attachment of accessories or equipment to studs will not be allowed.
- F. Hanger Wire Sound Isolators: Provide where indicated for sound-rated suspended ceilings.
- G. Adhesives and Joint Treatment Materials:
 - 1. Conform to requirements of ASTM C475/C475M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which work is to be installed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Install in accordance with reference standards and manufacturer's instructions [and as required to comply with seismic requirements].
- B. Tolerances:
 - 1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
 - 2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
 - 3. Shim as required to comply with specified tolerances.
- C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.
- D. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, furnishings or similar construction.

3.03 METAL SUPPORT INSTALLATION

- A. Metal Runners:
 - 1. Align and secure runner tracks accurately to partition layout at both floor and ceiling.
 - 2. Provide fasteners appropriate to substrate construction as recommended by manufacturer.
- B. Metal Studs:
 - 1. Position metal studs vertically in the runners, spaced as indicated.
 - 2. Place studs so that flanges face in same direction.
 - 3. Cut studs ½ inch short of full height to provide perimeter relief.
 - 4. Align and plumb partition framing accurately.
 - 5. Where partitions abut ceiling or deck construction or vertical structural elements, provide slip or cushion type joint between partition and structure as recommended by stud manufacturer to prevent transfer of structural loads or movements to partitions, and to provide lateral support.
 - 6. Provide horizontal bracing where necessary for lateral support.
 - 7. [Chase walls:
 - a. Position steel studs on opposite sides of chase directly across from each other.
 - b. Cut cross-bracing from gypsum board 12 inches high by chase wall width.
 - 8. Backer plates and blocking:
 - a. Where handrails, grab bars, cabinets, wall-mounted door stops, or other wall-hung items are attached to partitions, install backer plates or wood blocking accurately positioned and firmly secured to metal studs, whether or not such backer plates or blocking are indicated on Drawings.
 - b. Do not use wood blocking in fire-rated construction.
 - 9. Curved partitions:
 - a. Cut top and bottom runners through leg and web at 2-inch intervals for arc length.
 - b. Bend runners to uniform curve of radius indicated and locate straight lengths tangent to arcs.
 - c. Support outside (cut) leg of runners by clinching a 1-inch high x 25 gauge thick sheet steel strip to inside of cut legs using metal lock fasteners.
 - d. Attach studs to runners with 3/8 inch long pan head framing screws.
 - e. On straight lengths at ends of arcs, place studs 6 inches on center with last stud left free standing.
- C. Hat Channel Furring:

- 1. Attach hat-shaped furring channels either vertically or horizontally with fasteners through alternate wing flanges (staggered).
- 2. Space furring channels at 24 inches on center, unless otherwise indicated. Where furring is indicated to receive backer board, water resistant gypsum board with ceramic tile, or veneer plaster, space at 16 inches on center.
- 3. Install furring channels within 4 inches of floor line and ceiling line.
- D. Z-Furring:
 - 1. Securely attach narrow flanges of members to wall with concrete stub nails or power-driven fasteners, except as otherwise indicated.
 - 2. Sequence furring installation with installation of insulation.
- E. Ceiling and Soffit Support Systems:
 - 1. Secure hangers or rods to structural support by connecting directly to structure where possible; otherwise connect to inserts, clips or other anchorage devices or fasteners indicated.
 - 2. Space main runners, hangers and furring according to requirements of ASTM C754, except as otherwise indicated.
 - 3. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
 - 4. Attach directly to structural elements only; do not attach to metal deck. Loop hangers and wire tie directly or provide anchors or inserts.
 - 5. Install compression posts, splay wires and other accessories as required to comply with seismic requirements.
 - 6. Extend runners to within 6 inches of walls.
 - 7. Wire-tie or clip furring members to main runners and to other structural supports indicated. In fire resistance rated assemblies, wire-tie furring members; do not clip.
 - 8. Do not permit furring or runners to contact masonry or concrete walls.
 - 9. Provide 1 inch clearance between furring or runners and abutting walls and partitions.
 - 10. For proprietary framing system, comply with manufacturer's instructions.
 - 11. Curved (vaulted) applications:
 - a. Install furring channels to provide indicated radius for finished ceiling.
 - b. Space furring channels maximum 16 inches on center. Provide closer spacing if recommended by manufacturer for veneer base thickness and application method.
- F. Shaftwall:
 - 1. Provide slip or cushioned joints to isolate shaftwall system. Comply with manufacturer's instructions.
 - 2. Seal joints and penetrations on both sides of shaftwall system.
 - 3. Elevator shaft requirements:
 - a. Support elevator hoistway door frames independently of shaftwall framing system, or reinforce system in accordance with system manufacturer's instructions.
 - b. Where shaftwall system cannot be positioned within 2 inches of shaft face of structural beams, floor edges and similar projections into elevator shaft, provide continuous 5/8 inch gypsum board cants to cover tops of projections.

3.04 BOARD INSTALLATION

- A. Single Layer Gypsum Board on Metal Studs:
 - 1. Loosely butt gypsum board joints together and neatly fit.
 - 2. Do not place butt ends against tapered edges.
 - 3. Maximum allowable gap at end joints: 1/8 inch.
 - 4. Stagger joints on opposite sides of partitions.
 - 5. Apply ceiling boards first where gypsum board ceilings and wall occur.

- 6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
- 7. Screw board in place securely with screws spaced according to manufacturer's recommendations.
- B. Single Layer Gypsum Board on Furring:
 - 1. Apply gypsum board with long dimension at right angles to furring channel.
 - 2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
 - 3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.
- C. Double Layer Gypsum Board:
 - 1. Fasten base layer to studs or furring with screws, and attach face layer using laminating adhesive and screws, applied according to manufacturer's instructions.
 - 2. Offset face-layer joints at least 10 inches from parallel base-layer joints.
 - 3. Screw both layers to metal supports at double layer ceiling applications and where required for fire-rated construction.
- D. Direct Gypsum Board Adhesive Application:
 - 1. Apply adhesive with manufacturer's recommended spreader to backs of gypsum boards in band of four beads each to center of each board and along edges.
 - 2. Position boards vertically and press firmly in place to insure good bond.
 - 3. Fasten top and bottom of board if required.
- E. Water-Resistant Gypsum Board:
 - 1. Complete plumbing rough-in before gypsum board panels are erected.
 - 2. Separate gypsum panels from rough-in and fixtures by 1/4 inch space.
 - 3. Make necessary cut-outs and seal cut or exposed panel edges with thinned-down ceramic tile adhesive or with waterproof flexible sealant, as recommended by gypsum board manufacturer.
 - 4. Install water-resistant board horizontally.
 - 5. Do not place water-resistant board directly over vapor retarder.
 - 6. Prior to tile application, fill openings around pipes, fittings, fixtures, interior angles and other penetrations with waterproof flexible sealant, as recommended by gypsum board manufacturer. Do not fill 1/4 inch gap at bottom of panels.
- F. Cementitious Backer Board Installation:
 - 1. Install as indicated to comply with ANSI A108.11 and in accordance with manufacturer's instructions.
 - 2. Complete plumbing rough-in before boards are erected.
 - 3. Separate board from rough-in and fixtures and fill space as recommended by manufacturer.
 - 4. Securely fasten boards to substrate as required.
 - 5. Follow manufacturer's instructions for treatment of edge terminations.
 - 6. At joints and corners, embed fiberglass tape in skim coat of mortar.
- G. Exterior Soffits:
 - 1. Apply soffit board with long dimension across supports.
 - 2. Position end joints over supports.
 - 3. Allow at least 1/4 inch between edge of soffit board and adjacent construction, unless otherwise indicated.
 - 4. Fasten with corrosion-resistant screws.

- H. Gypsum Shaftwall:
 - 1. Erect gypsum board shaft liner for use as temporary shaft enclosure.
 - 2. Screw attach base and face layers according to manufacturer's instructions, for both vertical (shaft enclosure) and horizontal (duct enclosure) applications.
 - 3. Seal perimeters and openings to provide airtight installation.
 - 4. Install sloped gypsum board cants on hoistway side of shaftwall where slabs or beams project beyond shaftwall.
- I. Curved Gypsum Board:
 - 1. Provide board length such that one single board covers curved surface. Provide board thickness as recommended by manufacturer for minimum bending radius.2. Install boards perpendicular to framing.
 - 2. On concave installations, start fastening board at center of curve and work outward to ends of boards.
 - 3. On convex installations, begin board installation at one end of curved surface and fasten board to framing as it is wrapped around curve.
 - 4. Do not cut openings for penetrations until boards are installed and thoroughly dry.

3.05 SOUND-RATED CONSTRUCTION

- A. Insulation:
 - 1. Install sound attenuation blankets in sound-rated partitions and ceilings where indicated.
 - 2. Completely fill space between studs and framing to full height of partition wall or full area of ceiling.
 - 3. Fit carefully behind electrical outlets and other work penetrating sound-rated construction.
 - Install sound attenuation blankets in gaps between steel deck flutes and tops of sound-rated partitions, which are not fire-rated. Attach blankets in accordance with manufacturer's instructions.
- B. Gypsum Board:
 - 1. Install gypsum board same as for interior partitions and ceilings.
 - 2. Coordinate with installation of perimeter sealants.
- C. Acoustical Sealant:
 - 1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.
 - 2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
 - 3. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.
 - 4. After installation of gypsum board base layers, cut face layer sheets ½ inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4 inch open space with continuous sealant beads after installation of face layer.
 - 5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
 - 6. Seal sides and backs of electrical boxes to completely close off openings and joints.
- D. Sound Flanking Paths:
 - 1. Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.
 - 2. Seal joints between face layers at vertical interior angles of intersecting partitions.

3.06 ACCESSORY INSTALLATION

- A. Trim:
 - 1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
 - 2. Install metal corner beads at external corners.
 - 3. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.
- B. Control Joints:
 - 1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
 - 2. Install control joints within long runs of partitions, ceilings or soffits at approximately 30'-0" on center or as indicated.
 - 3. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.
- C. Special Trim: Install as indicated on drawings and in accordance with manufacturer's instructions.

3.07 FINISHING

- A. Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA 214, "Recommended Specification: Levels of Gypsum Board Finish".
 - 1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
 - 2. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
 - 3. Level 3: Gypsum board surfaces, where textured finishes or heavy vinyl wall papering will be used High-build Primer required as specified in Section 099123.
 - 4. Level 4: Gypsum board surfaces, except where another finish level is indicated High-build Primer required as specified in Section 099123.
 - 5. Level 5: Gypsum board surfaces requiring extra smooth surface for critical light, where indicated using spray-applied Primer-Surfacer or watered-down joint compound skim coat over whole surface and High-build Primer required as specified in Section 099123.
 - a. Surface Preparation: Complete gypsum board surface to Level 4 before applying primer surfacer.
 - 6. Primer-surfacer Application: Machine apply with airless sprayer in conformance with USG application instructions to a wet film thickness of 15 to 20 mils or 9 to 12 mils dry film thickness. Surface may be painted after overnight drying
- B. Interior Gypsum Board:
 - 1. Prefill:
 - a. Use setting-type joint compound. Mix joint compound according to manufacturer's directions.
 - b. Fill joints between boards flush to top of eased or beveled edge.
 - c. Fill joints of gypsum board above suspended ceilings in fire-rated partitions.
 - d. Wipe off excess compound and allow compound to harden.]
 - 2. Taping (Level 1):
 - a. Use taping or all purpose [conventional weight, lightweight or midweight] compound.
 - b. Butter taping compound into inside corners and joints.
 - c. Center tape over joints and press down into fresh compound.
 - d. Remove excess compound.
 - e. Tape joints of gypsum board above suspended ceilings.
 - 3. First coat (Level 2):

- a. Use taping or all-purpose [conventional weight, lightweight or midweight] drying-type compound, or setting-type joint compound.
- b. Immediately after bedding tape, apply skim coat of compound over body of tape and allow to dry completely in accordance with manufacturer's instructions.
- c. Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.
- 4. Second coat (Level 3): Use all purpose or topping (conventional weight, lightweight or midweight) drying type joint compound. After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 2 inches beyond edge of first coat.
- 5. Third coat (Level 4):
 - a. Use all purpose or topping conventional weight, lightweight or midweight drying type joint compound.
 - 1) After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2 inches beyond edge of second coat.
 - 2) Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
- 6. [Skim coat (Level 5):
 - a. Apply skim coat of all-purpose (conventional weight) drying-type compound or spray-applied Primer-Surfacer over exposed surfaces of gypsum board.
 - b. After skim coat has dried, touch-up and sand to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.]
- 7. Water-Resistant Gypsum Board: Treat fastener heads and joints with setting-type joint compound.
 - a. For joints to be covered with tile, apply tape and joint compound bedding coat and skim coat only; do not apply finish coats.
 - 1) Do not crown joints or leave excess compound on panels.
 - 2) Remove tool marks and ridges.
 - 3) For fastener heads to be covered with tile, apply one coat of joint compound.]
- 8. Cementitious Backer Board: Prepare and finish joints in accordance with manufacturer's instructions.

3.08 ADJUSTING

- A. Correct damage and defects which may telegraph through finish work.
- B. Leave work smooth and uniform.

END OF SECTION

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. Abuse-Resistant Gypsum Board
 - 4. Moisture and Mold-Resistant gypsum board.
 - 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.

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.

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. Architect approved equivalent.
- 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. Abuse-Resistant Gypsum Board: ASTM C1629/C1629M, Level 3.
 - 1. Long Edges: Tapered.
 - 2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
 - 3. Weight: 2.8 lbs. per sf.
 - 4. Flame spread rating: ASTM E84, 15.
 - 5. Water Absorption: ASTM C473, Less than 5%.
- E. 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

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. Architect approved equivalent.
 - 2. Thickness: 1/2 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. Trim: 1/16 inch thick extruded aluminum 6063-T5 mill finish manufactured by Gordon Inc., (unless noted otherwise), Fry Reglet or Architect approved equivalent:
 - a. J-Trim: Model JD-58 (5/8 inch gypsum board).
 - b. Drywall Reveal Trim: Model DRM-625-625 (5/8 inch deep by 5/8 inch wide) with DRM-SNAP-IN-50 (fits 625 profiles)
 - c. F Drywall Reveal Trims: Model FD-5834 (3/4 inch reveal 5/8 inch gypsum board).
 - d. Wallcovering Outside Corner: WCTOSC
 - e. Wallcovering Base / Termination: WCTBT125-217
 - f. 3-Step Outside Corner: Model 902-3X-625 (5/8 inch gypsum 5/8 inch gypsum).
 - g. Drywall Control Joints: Model DRM-50-25 2-PC unless indicated otherwise on the drawings.
 - 3. 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. 2³/₄", 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.

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. Architect approved equivalent.

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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. 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.
- K. 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. Abuse-Resistant Type: As indicated on Drawings.
 - 5. Moisture- and Mold-Resistant 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:
 - On ceilings, apply gypsum board indicated for base layers before applying base 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.

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. Neatly cut all openings so that they may be covered by plates and escutcheons.
- E. 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 099113 Exterior Painting and 099123 Interior Painting.
 - 3. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 099113 Exterior Painting and 099123 Interior Painting.
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

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

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. Ceramic and Porcelain tile.
 - 2. Waterproof membrane for thin-set tile installations.
 - 3. Setting products and grouts.
 - 4. Thresholds.
 - 5. Bullnose and Cove Trim.
 - 6. Metal transition strips between tile and other floor finishes.
- B. Related sections include the following:
 - 1. Section 079200 "Sealants" for sealing of expansion, contraction, control, corner, and isolation joints in tile surfaces.
 - 2. Section 092116 "Gypsum Board Assemblies" for gypsum backer units and cementitious backer units installed as underlayment for tile installations.
 - 3. Section 093016 "Quarry Tiling".

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. Tile Council of North America, Inc. (TCNA) "Handbook for Ceramic, Glass and Stone Tile Installation".
- C. Ceramic Tile Standards
 - 1. Bond Strength: ASTM C482
 - 2. Breaking Strength: ASTM C648
 - 3. Color Uniformity: ASTM C609
 - 4. Crazing: ASTM C424
 - 5. Facial Dimensions: ASTM C499
 - 6. Warpage: ASTM C482
 - 7. Waster Absorption: ASTM C373
 - 8. Wedging: ASTM C502
- D. Installation Standards: ANSI A108 series
- E. Material Standards: ANSI A118 Series
- F. ANSI A137.1 "American National Standards Specifications for Ceramic Tile"

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements
- C. Product Data:
 - 1. For each tile type.

- 2. Setting Products.
- 3. Grouts.
- 4. Sealants
- 5. Thresholds/ Transition Strips/Cove Trim/Bullnose Trim.
- 6. Waterproofing Systems and Products.
- 7. Accessories.
- D. Samples: submit actual products, no plastic mock-ups or photos representing colors and textures.
 - 1. Tile quantity to show full range of colors, markings and textures that will occur. Samples may be on color boards or as individual tiles of minimum size 4" square or actual tile size if less than 4" square.
 - 2. Thresholds/Transition Strips 8" long samples of each type.
 - 3. Sealant 6" sample of each type and color.
 - 4. Grouts Full range of colors available (actual grout in-lays, not plastic color representations).
 - 5. Cove and Bullnose Trim: Two (2) 3" long samples of each profile in the specified finish.
- E. Submit Installer qualification certifications for Installer(s) and Installing Contractor required by the Quality Assurance paragraph below.
- F. Maintenance Materials:
 - 1. Provide recommended cleaning methods, cleaning materials, stain removal materials and methods.

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. All tiles supplied must exceed standard grade requirement set forth in the latest ANSI tile specification A137.1.
- C. Manufacturer Qualifications:
 - 1. In business of manufacturing ceramic/porcelain tile for at least 15 years.
- D. Provide waterproofing membrane, crack control membrane, grout and setting materials from one manufacturer.
- E. Installer Qualifications:
 - 1. Installing Contractor is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 - 2. Installing Contractor employs Ceramic Tile Education Foundation Certified Installers.
 - 3. Not less than five (5) years experience with tile work and not less than three (3) installations of similar size and scope.
- F. The work hereunder shall be performed by a single entity with unit responsibility for field measurements, submittals, field installation and warranty.
- G. Allowable tolerances:
 - 1. Except for allowable tolerances in tile as specified, make corners of all tiles flush and level with corners of adjacent tile.
 - 2. For flat surfaces, the maximum deviation from true plan shall be 1/8"in 8' as measured under straight edge placed at any location on surface.
 - 3. Where noted or required slope floors to drains, complying with the tolerance stated for flat surfaces.

- H. Large format floor and wall tile shall be installed utilizing a tile leveling system.
- I. Slip Resistant Floor Surface Requirements: The floor surface of the finished installation shall comply with the slip resistant requirements of the authorities having jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Deliver material only in and undamaged condition; store above ground and in a dry place within building. Keep packaged material in original containers with seals unbroken and labels intact until time of use. Wrapped or bundled material must bear name of manufacturer and product. Immediately remove damaged or otherwise unsuitable material form job site.

1.07 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 MANUFACTURERS

- A. Following are approved manufacturers for materials shown in the specification:
 - 1. Ceramic wall and floor tile
 - a. Daltile
 - b. Marazzi
 - c. American Olean
 - d. Crossville
 - e. Florim USA
 - 2. Setting Products
 - a. LATICRETE International, Inc. (Basis of Specification)
 - b. MAPEI
 - 3. Grout
 - a. LATICRETE International, Inc. (Basis of Specification)
 - b. MAPEI or approved equivalent.
 - 4. Waterproofing & Crack Control Membranes
 - a. LATICRETE International, Inc. (Basis of Specification)
 - b. MAPEI or approved equivalent.
 - 5. Control joints and transition strips
 - a. Schluter Systems (Basis of Specification)
 - b. Architect approved equivalent
 - 6. Metal Trim: Cove and Bullnose
 - a. Schluter Systems (Basis of Specification)
 - b. Architect approved equivalent
- B. Tile shall be of size, type and pattern shown on the Drawings and described in this Project Manual. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- C. Proprietary names used to designate materials are not intended to imply that products of those manufacturers are required to the exclusion of Architect approved equivalent products of other manufacturers.

2.02 WALL, FLOOR, AND BASE TILE

- A. Tile Type PP-1: Porcelain Floor Tile:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:
 - a. Dal-Tile International Inc.: Synchronic Colorbody Porcelain
 - 2. Module Size: 12" x 24"
 - 3. Thickness: 5/16"
 - 4. Finish: Matte
 - 5. Joint Width: 1/8"
 - 6. Tile Color and Pattern: Beige SY31
 - 7. Grout Color: As selected by the Architect from the manufacturer's full color offering
- B. Tile Type WT-1: Glazed Ceramic Wall Tile Field
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:
 - a. Marazzi USA: Zellige Neo
 - 2. Module Size: 3" x 12"
 - a. Thickness: 5/16"
 - b. Joint Width: 1/8"
 - c. Tile Color and Pattern: ZL11 Gesso
 - d. Grout Color: As selected by the Architect from the manufacturer's full color offering
- C. Tile Type WT-2: Glazed Ceramic Wall Tile Backsplash
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:

a. Dal-Tile International Inc.: Miramo

- 2. Module Size: 1" x 6" Mosaic
 - a. Thickness: 5/16"
 - b. Finish: Glossy
 - c. Joint Width: 1/8"
 - d. Tile Color and Pattern: MR49 Reef
 - e. Grout Color: As selected by the Architect from the manufacturer's full color offering

2.03 SETTING PRODUCTS

- A. Wall Tile.
 - 1. Large Format Tile: LATICRETE MULTIMAX[™] LITE Polymer Fortified Mortar.
 - 2. Small Format Tile: LATICRETE 254 Platinum Polymer Fortified Thin Set Mortar.
- B. Floor Tile
 - 1. LATICRETE 125 TRI MAX[™] Adhesive Mortar.

2.04 GROUTS

- A. Walls and Floors: LATICRETE SPECTRALOCK® PRO Premium Grout (Epoxy grout).
- B. Color: to be selected by Architect.

2.05 THRESHOLDS

- A. Marble:
 - 1. Profile: As shown on Contract Drawings.

- 2. Size: Match jamb length. Align width with inside edge of door frame. See detail on Contract Drawings.
- 3. Location: At locations shown on Door Schedule and Floor Finish Drawing.
- 4. Color: Provide color range to coordinate with range of submitted tile colors. Architect shall select final color.

B. Metal:

- 1. Manufacturer: Schluter or Architect approved equal.
- 2. Material: Satin Stainless Steel.
- 3. Style: as indicated by transition details shown on Contract Drawings.
- 4. Size: Height to match tile thickness.

2.06 ACCESSORIES

- 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. Trim
 - 1. Cove: Schluter Dilex EHK Brushed Stainless Steel (EB) Cove.
 - a. Provide EHK outside and inside cove corners.
 - b. Provide EHK connectors and end caps.
 - 2. Edge Trim: Schluter Schiene Brushed Stainless Steel.
 - 3. Outside Corner: Schluter ECK-E Brushed Stainless Steel Outside Corner
- C. Sealant
 - Provide 100% silicone sealant with anti-microbial technology from grout manufacturer.
 a. LATASIL™
 - b. Color of sealant to match grout.
- D. Crack Isolation Membrane
 - 1. LATICRETE HYDRO BAN®
- E. Control Joints: Provide Schluter Systems Dilex-BWS
 - 1. Provide at all wall and floor control joints.
 - 2. Colors: As selected by Architect from manufacturer's full range of colors.
 - 3. Height as required.
- F. Tile Cleaner
 - 1. 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.

2.07 MEMBRANE SYSTEM AT SHOWERS & LAVATORY WALLS

- A. Showers with ceramic tile floors.
 - 1. LATICRETE HYDRO BAN® Waterproofing Membranes under shower floor and threshold and full height vertically on all shower walls.
- B. Showers with precast shower bases.
 - 1. LATICRETE HYDRO BAN® Waterproofing Membranes 6' vertically on all shower walls from top of terrazzo base.
- C. Lavatories.

1. LATICRETE HYDRO BAN® Waterproofing Membranes 18" vertically on all walls and horizontally over entire floor surface.

D. Hose Tower

1. LATICRETE HYDRO BAN® Waterproofing Membrane vertically full height of wall, on all wall surfaces to receive quarry tile and horizontally over entire floor area to receive quarry tile.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine all surfaces to receive the parts of the Work specified herein.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are:
 - a. 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 thinset 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 joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
 - 4. Verify all dimensions of existing and subsequent construction.
 - 5. Verify that GWB backing is the required type and is installed and prepared in accordance with Gypsum Association GA 216.
 - 6. Application of materials constitutes acceptance of substrate.
 - 7. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of Work, and similar items located in or behind tile have been completed before installing tile.
 - 8. On CMU walls to receive membrane and tile, smooth out any depressions with LATICRETE 254 Platinum Thin Set Mortar or LATICRETE 226 Thick Bed Mortar mixed with LATICRETE 3701 Mortar Admix or 3701 Fortified Mortar as recommended by manufacturer.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Keep containers in which tile and other materials are packed, dry until tiles and other materials are removed; take every precaution to see that tiles are not stained before they are set in place. Maintain temperatures in rooms where tile is being set at a minimum of 50 F and for 7 days after tile has been set. Vent temporary heaters to outside to prevent carbon dioxide damage to the Work.
- D. Layout tile in each area in such a manner as to minimize cutting of tile, especially cuts less than one half-tile size, and maximize alignment of joints.
- E. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in 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.

3.02 INSTALLATION OF WATERPROOFING MEMBRANE

A. Install waterproofing membrane as recommended by manufacturer.

B. Protect membrane until tile installation.

3.03 INSTALLATION OF TILE

- A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation"; comply with TCNA installation methods.
 - 1. Mortar Coverage for Ceramic/Porcelain Tile: Minimum contact area must be 95% with no voids exceeding 2 square inches and no voids within 2" of the tile corners. All corners and edges of the tiles must be fully supported. Back-parging or back-buttering is recommended on all large format tile. Use notched trowel sized to facilitate the proper coverage.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. 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 that plates, collars, or covers overlap tile.
 - 1. Install stainless steel cove base at all wall tile/floor tile intersections. Provide matching inside and outside corners where required. Provide matching connectors and end caps if required.
 - 2. Install specified edge trim at the top of partial height ceramic tile walls, at the vertical edge of exposed tile terminations and at the front edge of shower ceilings.
 - 3. Install specified bullnose trim at all outside corners unless using a bullnose tile.
- E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet in not apparent in finished work.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Crack Isolation Membrane Installation
 - 1. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 - 2. Allow crack isolation membrane to cure before installing tile or setting materials over it.
 - 3. Control Joints: Locate manufactured control joints in tile surfaces directly above joints in concrete substrates. Do not saw.
 - 4. Prepare joints and apply sealants to comply with requirements of Division 07 Section "Sealants ".
- H. Grout tile to comply with the requirements of the following installation standards:
 - 1. For ceramic tile grouts (epoxy grout), comply with ANSI A108.10.
- I. At showers, tubs, and similar wet areas, install cementitious backer units and treat joints to comply with manufacturer's instructions for type of application indicated.

- J. All inside corners of wall tile shall be caulked (sealant), not grouted.1. Install bond breaker behind all caulking.
- K. Unless otherwise noted, all tile patterns are to be centered. Obtain Architect approval of all layouts before proceeding.
- L. Provide bullnose tile at wall tile/epoxy base transition in kitchen.
- M. All outside corners and tile terminations exposed to view shall receive a bullnose tile or Schluter trim.

3.04 INSTALLATION OF GROUT

- A. Install grout pursuant to ANSI A 108.10 and A 118.8.
- B. Observe the general grouting procedures outlined in ANSI A108.10, Installation of Grout in Tilework.
- C. Do not disturb, walk on or grout tiles until adhesive or dry-set has cured completely.
- D. Remove all spacers, strings, ropes or pegs before grouting.
- E. Wipe tile surfaces to remove dust or substances that may cause color contamination or discoloration during grouting.
- F. Cure epoxy grout in accordance with manufacturer's recommendations.
- G. Keep grout joints clean and free from standing water, dust and foreign substances.

3.05 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than fourteen (14) days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Prohibit foot and wheel traffic from tiles floors for at least seven (7) days after grouting is completed.
- D. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- E. Protect all walls from impact or vibration from impact to adjacent or opposite walls for 14 days minimum.
- F. Protect all tile installation from freezing or total water immersion for 21 days minimum.
- G. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

H. Contractor to supply to Owner information regarding regular maintenance of wall and floor tile. See Section 017700 -Closeout Procedures.

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 the following:
 - 1. Quarry floor and wall tile.
 - 2. Waterproof membrane for thin-set tile installations
 - 3. Setting products and grouts.
 - 4. Thresholds
- B. Related sections include the following:
 - 1. Section 079200 "Sealants" for sealing of expansion, contraction, control, corner, and isolation joints in tile surfaces.
 - 2. Section 092116 "Gypsum Board Assemblies" for gypsum backer units and cementitious backer units installed as underlayment for wall tile installations.

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. Tile Council of North America (TCNA) "Handbook for Ceramic, Glass, and Stone Tile Installation".
- C. American National Standards Institute (ANSI)
 - 1. ANSI A108/A118/A136.1: "Installation of Ceramic Tile".
 - 2. ANSI A118.10: "Installation of Grout In Tilework".
 - 3. ANSI A137.1: "American National Standards Specifications for Ceramic Tile".

D. Quarry Tile Standards

- 1. Absorption: ASTM C373
- 2. Compressive Strength: ASTM C67
- 3. Freeze/Thaw: ASTM C1026
- 4. Abrasion Resistance: ASTM C1026
- 5. Breaking Strength: ASTM C648
- 6. Facial Dimensions: ASTM C499
- 7. Warpage: ASTM C482
- 8. Wedging: ASTM C502
- 9. Static Coefficient of Friction: ASTM C1028
- E. Setting Materials and Grout: ANSI A108 series

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements
- C. Product Data:
 - 1. Quarry Tile
 - 2. Grout

- 3. Adhesive
- 4. Waterproofing Systems
- 5. Leveling products
- 6. Thresholds
- 7. Accessory products
- D. Samples: submit actual products, no plastic mock-ups or photos representing colors and textures.
 - 1. Tile quantity to show full range of colors, markings and textures that will occur. Samples may be on color boards or as individual tiles of minimum size 6" square.
 - 2. Thresholds 12" long samples of each type.
 - 3. Sealant 6" sample of each type and color.
 - 4. Grouts Full range of colors available.
- E. Maintenance Materials:
 - 1. Include recommended cleaning methods, cleaning materials, and stain removal methods.

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. All tiles supplied must exceed standard grade requirement set forth in the latest ANSI tile standard ANSI A137.1.
- C. Manufacturer Qualifications:
 - 1. In business of manufacturing quarry tile for at least 15 years.
 - 2. Capable of supplying all tiles listed in these guidelines; no partial suppliers are acceptable.
- D. Provide tile, grout and setting materials from one distributor.
- E. Installer Qualifications:
 - 1. Not less than five (5) years' experience with tile work and not less than three (3) installations of similar size and scope.
- F. The work hereunder shall be performed by a single entity with unit responsibility for field measurements, submittals, field installation and warranty.
- G. Allowable tolerances:
 - 1. Except for allowable tolerances in tile as specified, make corners of all tiles flush and level with corners of adjacent tile.
 - 2. For flat surfaces, the maximum deviation from true plan shall be 1/8"in 8' as measured under straight edge placed at any location on surface.
 - 3. Where noted or required slope floors to drains, complying with the tolerance stated for flat surfaces.
- H. Slip Resistant Floor Surface Requirements: The floor surface of the finished installation shall comply with the slip resistant requirements of the authorities having jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.

C. Deliver material only in and undamaged condition; store above ground and in a dry place within building. Keep packaged material in original containers with seals unbroken and labels intact until time of use. Wrapped or bundled material must bear name of manufacturer and product. Immediately remove damaged or otherwise unsuitable material form job site.

1.07 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 MANUFACTURERS

- A. Following are approved manufacturers for materials shown in the specification:
 - 1. Quarry wall and floor tile
 - a. Daltile (Basis of Design)
 - b. American Olean
 - c. Florida Tile
 - 2. Setting Products
 - a. LATICRETE International, Inc. (Basis of Design)
 - b. MAPEI
 - 3. Grout
 - a. LATICRETE International, Inc. (Basis of Design)
 - b. MAPEI or approved equivalent.
 - 4. Waterproofing Membranes
 - a. LATICRETE International, Inc. (Basis of Design)
 - b. MAPEI or approved equivalent.
- B. Tile shall be of size, type and pattern shown on the Drawings and described in this Project Manual.
 - 1. Proprietary names used to designate materials are not intended to imply that products of those manufacturers are required to the exclusion of Architect approved equivalent products of other manufacturers

2.02 WALL, FLOOR, AND BASE TILE

- A. Tile Type QT-1: Quarry Tile
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:
 - a. Dal-tile International Inc.: Quarry Tile
 - 2. Module Size: 6 inch x 6 inch.
 - 3. Thickness: 1/2"
 - 4. Finish: Abrasive
 - 5. Joint Width: 3/8"
 - 6. Tile Color and Pattern: Arid Flash 0Q48; Grid Pattern
 - 7. Grout Color: As selected by the Architect from the manufacturer's full color offering.
 - 8. Trim Units: Coordinated sizes and coursing of adjoining flat tile where applicable, and matching characteristics of adjoining tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Round top cove base
 - b. Round top cove base corner left
 - c. Round top cove base corner right
 - d. Cove base inside corner

2.03 SETTING PRODUCTS

- A. Quarry Tile
 - 1. LATICRETE 254 Platinum Multipurpose Thin Set Mortar.

2.04 GROUTS

- A. Base and Floors: LATICRETE SPECTRALOCK® 2000 IG (Epoxy grout).
- B. Color: to be selected by Architect.

2.05 LEVELING UNDERLAYMENT

- A. Floors: Cement-based underlayment for leveling and patching interior substrates.
 - 1. Laticrete NXT Level or NXT Skim.
 - 2. Architect Approved Equivalent.

2.06 THRESHOLDS

- A. Marble:
 - 1. Profile: As shown on Contract Drawings.
 - 2. Size: Match jamb length. Align width with inside edge of door frame. See detail on Contract Drawings.
 - 3. Location: At locations indicated on Door Schedule and Floor Finish Drawing.
 - 4. Color: Provide color range to coordinate with range of submitted tile colors. Architect shall select final color.

2.07 ACCESSORIES

- A. Control Joints: Provide Schluter Systems Dilex-BWS
 - 1. Provide at locations shown on drawings.
 - 2. Colors: As selected by Architect from manufacturer's full range of colors.

2.08 MEMBRANE SYSTEM AT KITCHEN WALLS

- A. Kitchen
 - 1. LATICRETE 9235 Waterproofing Membrane with reinforcing fabric 18" vertically at all kitchen wall/floor intersections and horizontally under entire kitchen floor.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine all surfaces to receive the parts of the Work specified herein.
 - 1. Verify all dimensions of existing and subsequent construction.
 - 2. Verify that GWB backing is the required type and is installed and prepared in accordance with Gypsum Association GA 216.
 - 3. Application of materials constitutes acceptance of substrate.
 - 4. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of Work, and similar items located in or behind tile have been completed before installing tile.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

- C. Keep containers in which tile and other materials are packed, dry until tiles and other materials are removed; take every precaution to see that tiles are not stained before they are set in place. Maintain temperatures in rooms where tile is being set at a minimum of 50 F and for 7 days after tile has been set. Vent temporary heaters to outside to prevent carbon dioxide damage to the Work.
- D. Layout tile in each area in such a manner as to minimize cutting of tile, especially cuts less than one half-tile size, and maximize alignment of joints.
- E. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in 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.

3.02 INSTALLATION OF WATERPROOFING MEMBRANE

- A. Install waterproofing membrane and reinforcing fabric as recommended by manufacturer.
- B. Protect membrane until tile installation.

3.03 INSTALLATION OF TILE

- A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic, Glass and Stone Tile Installation" (latest edition); comply with TCNA installation methods indicated.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. 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 that plates, collars, or covers overlap tile.
- E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 - 2. Prepare joints and apply sealants to comply with requirements of Division 07 Section "Sealants".
- G. Grout tile to comply with the requirements of the following installation standards:
 - 1. For quarry tile grouts (epoxy grout), comply with ANSI A118.10.
- H. All inside corners of wall tile shall be caulked, not grouted.

- 1. Install bond breaker behind all caulking.
- I. Unless otherwise noted, all tile patterns are to be centered. Obtain Architect approval of all layouts before proceeding.
- J. All outside corners and tile terminations exposed to view shall receive a bullnose tile.

3.04 INSTALLATION OF GROUT

- A. Install grout pursuant to ANSI A108.10 and ANSI A118.8.
- B. Observe the general grouting procedures outlined in ANSI A108.10, Installation of Grout in Tilework
- C. Do not disturb, walk on or grout tiles until adhesive or dry-set has cured completely.
- D. Remove all spacers, strings, ropes or pegs before grouting.
- E. Wipe tile surfaces to remove dust or substances that may cause color contamination or discoloration during grouting.
- F. Cure epoxy grout in accordance with manufacturer's recommendations.
- G. Keep grout joints clean and free from standing water, dust and foreign substances.

3.05 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than fourteen (14) days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Prohibit foot and wheel traffic from tiles floors for at least seven (7) days after grouting is completed.
- D. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- E. Protect all walls from impact or vibration from impact to adjacent or opposite walls for 14 days minimum.
- F. Protect all tile installation from freezing or total water immersion for 21 days minimum.
- G. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.
- H. Contractor to supply to Owner information regarding regular maintenance of quarry tile. See Section 017700 –Closeout Procedures.

END OF SECTION

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 acoustical panels and exposed suspension systems with accessories and trims for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch (150-mm) long Samples of each type, finish, and color.
- 1.04 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For testing agency.
 - B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes 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. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component including decorative moldings, equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.09 WARRANTY

- A. Provide manufacturer's 30-year limited systems warranty covering defects in materials and / or factory workmanship for ceiling panels and suspension systems.
- B. Provide manufacturer's 10-year limited warranty covering sagging and warping defects caused by materials or factory workmanship for Humidity and Moisture-resistant ceiling systems.
- C. Provide manufacturer's 1-year limited warranty covering defects in materials and / or factory workmanship for Acoustical canopy ceiling systems.

PART 2 - PRODUCTS

- 2.01 PERFORMANCE REQUIREMENTS
 - A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - B. Surface-Burning Characteristics: Comply with ASTM E84 testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.02 ACOUSTICAL PANELS (ARMSTRONG)

- A. Products:
 - 1. Type ACP -1
 - a. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1) Armstrong World Industries, Inc.: Kitchen Zone.
 - 2) Or approved equal.
 - b. Color: White.
 - c. LR: ASTM E1477; Not less than 0.89.
 - d. NRC: ASTM C423; N/A.
 - e. CAC: ASTM C1414; Not less than 33.
 - f. Articulation Class (AC): ASTM E1111/E1111M; Classified with UL label.
 - g. Edge/Joint Detail: Square Lay-in.
 - h. Thickness: 5/8 inch (19 mm).
 - i. Modular Size: 24 by 24 inches (610 by 610 mm).
 - j. Durability: Scratch Resistant, Impact Resistant, Soil Resistant, Washability
 - k. Humidity Resistant HumiGuard Plus with 10-year warranty

- 2. Type ACP 2
 - a. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1) Armstrong World Industries, Inc.: Calla.
 - 2) Or approved equal.
 - b. Color: White
 - c. LR: ASTM E1477; Not less than 0.85.
 - d. NRC: ASTM C423; Not less than 0.85.
 - e. CAC: ASTM C1414; Not less than 35.
 - f. Articulation Class (AC): ASTM E1111/E1111M; Not less than 170
 - g. Edge/Joint Detail: Beveled Tegular.
 - h. Thickness: 5/8 inch (19 mm).
 - i. Modular Size: 24 by 24 inches (610 by 610 mm).
 - j. Humidity Resistant HumiGuard Plus with 10-year warranty
- 3. Type ACP 3
 - a. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1) Armstrong World Industries, Inc.: Cermaguard.
 - 2) Or approved equal.
 - b. Color: White
 - c. LR: ASTM E1477; Not less than 0.79.
 - d. NRC: ASTM C423; Not less than 0.55.
 - e. CAC: ASTM C1414; Not less than 38.
 - f. Articulation Class (AC): ASTM E1111/E1111M; Not less than 170
 - g. Edge/Joint Detail: Beveled Tegular.
 - h. Thickness: 5/8 inch (19 mm).
 - i. Modular Size: 24 by 24 inches (610 by 610 mm).
 - j. Humidity Resistant HumiGuard Plus with 10-year warranty
- 2.03 METAL SUSPENSION SYSTEMS, GENERAL
 - A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 - B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635/C635M.
 - 1. High-Humidity Finish: Comply with ASTM C635/C635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
 - C. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - Size: Select wire diameter so its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.
 - E. Hanger Rods Flat Hangers: 1/4 inch diameter, Mild steel, zinc coated or protected with rust-inhibitive paint.

- F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch-(1-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- G. Cold Rolled Channel: 1 1/2 inch deep, 16 MSG cold rolled steel with protective zinc coating. Tie to supporting structure with 12 SWG galvanized wire ties. Install at 4'-0" o.c. maximum or as indicated on the drawings.
- H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place. Conform to "Code of Practices for Acoustical Ceiling System Installations" by CISCA Ceilings & Interior Systems Contractors Association.
- K. Hold-Down Clips: Provide manufacturer's standard hold-down clips (Armstrong CHDC or equal) spaced 24 inches (610 mm) o.c. on all cross tees. At exterior locations provide Exterior Hold Down Clips in size determined by the panel thickness (Armstrong EHDC or equal).
- L. Retention Clips: Provide Armstrong 414 Retention Clips in Gymnasium and Activity spaces. Install as recommended by the manufacturer to secure each panel.
- M. Shadow Reveal Transition Molding: Provide in size to match the adjacent grid field in 10 foot lengths, 1 1/4" height and width as determined by field grid. Armstrong 7901 for 9/16" grid and 7902 for 15/16" grid.
- N. Canopy system installations shall be as recommended by the manufacturer. Panels shall not be field altered, drilled or cut.
 - 1. Provide a minimum of 18 inches between panels.
 - 2. Panels shall not be field painted.
 - 3. Hanging system shall not be tied to another commercial suspension system. Hang system from building structure in accordance with the manufacturer's specifications.
- 2.04 METAL SUSPENSION SYSTEM 15/16 GRID
 - 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. Armstrong World Industries, Inc.: 15/16 Prelude and 15/16 Prelude XL.
 - 2. CertainTeed Corp.
 - 3. Chicago Metallic Corporation.
 - C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch (24 mm) wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Grid and Cap Material: Hot-dip galvanized steel with Aluminum cap.

- 5. Cap Finish:
 - a. White for acoustical panel installations.
 - b. Color as selected by the Architect for the 360 Painted Grid system.
- D. Suspended Ceiling Grid Moldings: StyleStix TM Rigid PVC; Sag, mold, mildew and bacteria resistant; snap-on grid and perimeter moldings (Items #1310, 1311 and 1312) in lengths required. System connects to a standard 15/16" grid suspension system with wall molding profile. The StyleStix system shall have the following physical characteristics:
 - 1. Dimensions: 1 1/2 inch wide x 3/4 inch deep x 72 inch long (#1310)
 - 2. Sag Resistance: HumiGuard Plus.
 - 3. Fire Rating: Class A
 - 4. Anti-microbial: Mold, Mildew and Bacteria resistant
 - 5. Durability: Soil, scratch and impact resistant
 - 6. Material: PVC
 - 7. Finish: White, paintable surface.
 - 8. Warranty: Limited Lifetime manufacturer's warranty.
- 2.05 METAL EDGE MOLDINGS AND TRIM
 - A. Basis-of-Design Product : Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc. 15/16 inch edge Angles, Moldings and Trims compatible with the grid specified. Provide gasketed CLEAN ROOM Edge Moldings and Trim where CLEAN ROOM grids are specified.
 - 2. Chicago Metallic Corporation.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.06 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints
 - a. Pecora Corporation ; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation: SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.

H2M

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. 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, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. 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.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. 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, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to short axis of space.
 - 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.05 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Linear metal ceilings.
- B. Suspended metal support system and perimeter trim.

1.02 RELATED REQUIREMENTS

- A. Section 092116 Gypsum Board Assemblies: Suspension system as a substrate for this section.
- B. Section 284600 Fire Detection and Alarm: Fire alarm components in ceiling.
- C. Section 211300 Fire-Suppression Sprinkler Systems: Sprinkler heads.
- D. Section 265100 Interior Lighting: Light fixtures.
- E. Section 275116 Public Address Systems: Audio speakers for ______ system.
- F. Section 284600 Fire Detection and Alarm: Fire alarm components in ceiling.

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; 2020.
- B. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2022.
- C. ASTM C636/C636M Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- D. ASTM E1264 Standard Classification for Acoustical Ceiling Products; 2022.
- E. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- F. ASTM E580/E580M Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

1.04 DESIGN REQUIREMENTS

A. Design components to ensure light fixtures and installed accessories will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.
- B. Preinstallation Meeting: Convene one week before starting work of this section.
- C. Sequencing: Supply hanger clips during steel deck erection. Supply additional hangers and inserts as required.

1.06 SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. Product Data: Furnish for component profiles.
- C. Shop Drawings: Indicate reflected ceiling plan, location of mechanical and electrical components, and points of suspension.
- D. Samples: Submit two samples 6-inch by 6-inch inch (152 by 152 mm) in size illustrating color and finish of exposed to view components.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016100 BASIC PRODUCT REQUIREMENTS, for additional provisions.
 - 2. Extra Linear Panels: Provide standard length panels matching the installed panels in all respects in a quantity of not less than 5% of the Linear Metal Ceiling area with a minimum of two full size panels.

1.07 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 the work of this section.
 - 1. Minimum three years documented experience.
 - 2. Approved by metal ceiling manufacturer.
- C. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- D. Coordination of Work: Coordinate ceiling work with isntallers of related work includng, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems and sprinklers.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Accept factory-finished products on site in manufacturer's unopened factory packaging only; reject opened packages.
- B. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.09 WARRANTY

- A. See Section 017800 CLOSEOUT SUBMITTALS, for additional warranty requirements.
- B. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failues include, but are not limited to the following:
 - 1. Acoustical Metal Panels: Sagging and warping
 - 2.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design: Linear Metal Ceilings:
 - 1. Armstrong World Industries, Inc; MetalWorks Immix Linear Panelized Torsion Spring System:, www.armstrongceilings.com/#sle.
 - 2. Substitutions: Section 012500 Product Substitutions.

2.02 SYSTEMS

- A. METALWORKS Immix Linear Panelized Torsion Spring Interior Metal Panels: ABAF-1
 - 1. Surface Texture: Smooth
 - 2. Composition: Aluminum Metal Thickness 0.032"
 - 3. Edge Profile: Square Panelized
 - 4. Perforations: M1 (Unperforated)
 - 5. Size and Configuration:
 - a. 24" wide x 96" long x 6" high with end caps.
 - b. 4 Blades per Panel
 - 6. Flame Spread: Class A
 - 7. Finish: Sequels La Jolla Oak (SQLO)
 - 8. Infill Panels: 2821BK Calla Square Lay-In 24" x 48" in Black Finish
 - 9. Provide accessories as required to provide a complete system installation indicated on the drawings

2.03 ACCESSORIES

- A. Air Diffusion:
 - 1. Air Units: with 2 inch slot with 8 inches wide with dampered top mounted collars.
 - a. Manufactured by others from 0.024 inch thick steel with gasketed lower flanges and factory applied acoustical insulation adhered to internal surfaces.
 - b. "L" shaped directional vanes painted black.
 - c. Optional remote control damper assembly with control cable extending through air distribution slot.
- B. Access Doors: manufactured from galvanized steel with square edges and coated to match linear metal panels.
- C. Accessories: Stabilizer bars and clips as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.
- D. Suspension Members: Formed steel sections, with integral attachment points; galvanized finish; size and type to suit application and ceiling system flatness requirement specified.
 - 1. Symmetrical Carrier:
 - a. Manufactured to an inverted "U" shape from 0.040 inch aluminum 144 inches long. Coated with black polyester enamel.
 - b. Slotted at appropriate intervals to receive stabilizing components.
 - 2. Stabilizer Bars: manufactured from 0.025 inch thick aluminum, 49 13/16 inches long. Coated with black polyester enamel.
 - 3. Radius Carrier: manufactured to an inverted "U" shape from 0.040 inch thick aluminum, 144 inches long with integral carrier tabs, painted black.
- E. Suspension Wire: Steel, annealed, galvanized finish, 9 gauge, 0.1144 inch (2.91 mm) diameter.

F. Subgirt Members: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating; formed to resist imposed loads and to provide attachment for linear ceiling and accessories.

2.04 FABRICATION

- A. Shop cut linear panels to accommodate mechanical and electrical items.
- B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed linear panels; back brace internal corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions for compliance with the manufacturer's installation requirements and specified tolerances, with installer present. Correct any deficiencies found before commencing the work of this section.
- B. Verify that layout of hangers will not interfere with other work.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

- A. Suspension Components:
 - 1. Install after above-ceiling work is complete in accordance with manufacturer's instructions, ASTM C636/C636M, and ASTM E580/E580M.
 - 2. Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.
 - 3. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.
 - 4. Locate suspension system for linear panel layout parallel to building lines according to reflected plan.
 - 5. Symmetrical Carriers: Installed 50 inches on center by direct suspension from existing structure with not less than 12 gauge hanger wires wrapped tightly 3 full turns, spaced 48 inches on center.
 - 6. Stabilizer Bars: Installed perpendicular to symmetrical carrier (24) (48) inches on center.
- B. Linear Metal Ceiling:
 - 1. Install linear panels and other system components in accordance with manufacturer's instructions.
 - 2. Stagger end joints minimum 12 inches (300 mm) unless noted otherwise on the approved shop drawings.
 - 3. Butt interior end joints tight.
 - 4. Install filler strips between linear panels at interior locations.
 - 5. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.
 - 6. Install end caps at sight-exposed ends of linear panels.
 - 7. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.
 - 8. Access Panels: Installed in accordance with manufacturers recommendations.

- A. Maximum Variation from Flat and Level Surface: 1/16 inch in 10 feet (____ mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.
- C. Maximum Variation From Dimensioned Position: 1/4 inch (6 mm).

3.04 CLEANING

- A. Clean exposed surfaces in accordance with the manufacturer's written instructions.
- B. Replace damaged or abraded components.

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 wall base.
 - 2. Resilient molding accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.
- C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

1.04 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. Furnish not less than 10 linear feet (3 linear m) for every 300 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) nor more than 90 deg F (32 deg C).

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) nor more than 95 degrees F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 THERMOPLASTIC-RUBBER BASE

- A. Manufacturers:
 - 1. Basis-of-Design: Mannington Commercial
 - 2. Roppe Corporation, USA
 - 3. Johnsonite; A Tarkett Company
 - 4. Architect approved equivalent.
- B. Product Standard: ASTM F1861, Type TP Rubber (Mannington).
 - 1. Group: 1 (solid, homogeneous).
 - 2. Style and Location:
 - a. Style D, Sculptured: Provide types in areas indicated of the drawings.
 - 1) Profile: Edge Effects Flair 3"
- C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- D. Thickness: 0.125 inch.
- E. Height: 3 Inches or as indicated on Drawings.
- F. Lengths: 120-foot Coils or in manufacturer's standard coil length.
- G. Outside Corners: Preformed.
- H. Inside Corners: Preformed.
- I. Colors: Black Brown

2.02 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mannington Commercial
 - 2. Roppe Corporation, USA.
 - 3. VPI, LLC, Floor Products Division.
 - 4. Or approved equal.
- B. Description: Rubber nosing for carpet reducer strip for resilient flooring joiner for vinyl tile and carpet transition strips.
- C. Profile and Dimensions: Fusion profile, height as needed for specified flooring.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by Architect from manufacture's full range of colors and patterns.

2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

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 Stair Tread with Riser.
 - 2. Rubber Stair Landing Surfacing.
 - 3. Related Accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 033500 Concrete Finishing
 - 2. 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. ASTM F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring".
- C. ASTM F2169 "Standard Specification for Resilient Stair Treads".

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements
- C. Product Data: Manufacturer's technical data for each type of stair tread, stair riser, stair landing flooring, adhesives and any other related accessories.
- D. Samples for Initial Selection Purpose: Manufacturer's standard and custom color samples in form of actual sections of 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 required. The Architect shall select the colors, patterns, and textures from the manufacturer's complete range of standard and custom colors.
- E. Warranty: Submit manufacturer's standard limited commercial warranty.
- F. Maintenance Instructions: Submit two (2) Copies of manufacturer's recommended maintenance practices for each type of stair tread and flooring required.

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. Manufacturer Qualifications: Provide resilient stair treads, risers and stair landing flooring materials manufactured in the United States of America by a firm with a minimum of 10 years' experience producing resilient stair flooring materials of type equivalent to those specified.

C. Provide each type of stair tread, riser if required, floor landing material and accessories as produced by a single manufacturer, including recommended primers, adhesive, and sealants.

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 stair covering manufacturer's specified range.

1.07 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65-degrees F (18 deg C) in spaces to receive stair covering materials for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store stair covering 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. Maintain relative humidity at service levels, or between 40% and 65% RH.
- C. Install stair covering materials after other finishing operations, including painting, have been completed.

1.08 WARRANTY

A. Provide manufacturer's standard limited commercial warranty covering manufacturing and material defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design: Mannington Commercial
- B. Other acceptable manufacturers provided they meet or exceed all requirements of this specification:
 - 1. Mannington Commercial, 1844 U.S. Highway 41 S.E. Calhoun, GA 30701. Phone: 800-241-2262 (Basis of Specification)
 - 2. Roppe Corporation, 1602 N. Union St., Fostoria, OH 44830. Phone: 800-537-9527
 - 3. FLEXCO, Corporation, 1401 East 6th Street, Tuscumbia, AL 35674. Phone: 800-633-3151
 - 4. Johnsonite Inc., 16910 Munn Road, Chagrin Falls, Ohio 44023. Phone: 800-899-8916
 - 5. Or Architect approved equal.

2.02 STAIR COVERING MATERIALS:

- A. Manufacturer/Product: Mannington Commercial; ColorSpec One-Step Stair Tread with Visually Impaired Strip.
 - 1. Product: Thermoset Vulcanized Rubber Type TS
 - 2. Thickness: 1/8 inch (3.2 mm)
 - 3. Lengths: 6' (1828.8 mm)
 - 4. Profile: ColorSpec, One-Step (Sculptured)
 - 5. Nose: Square Profile
 - 6. Color: from manufacturer's full line of colors.

7. Abrasive Strip Insert Color: from manufacturer's full line of colors.

2.03 STAIR LANDING TILES

A. 1/8" thick, manufacturer's standard tile size with raised square design to match stair treads.

2.04 ACCESSORY MATERIALS

A. Adhesive: Rubber Stair Treads, Risers and Landing manufacturer's recommended product that meets VOC requirements of the project.

PART 3 EXECUTION

3.01 INSPECTION

- A. The Installer shall inspect stair tread and landing surfaces to determine that they are satisfactory. A satisfactory surface is defined as one that is clean, smooth, permanently dry, flat 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 substrates to determine if surfaces are sufficiently cured and dry as well to ascertain presence of curing compounds.
- C. Do not allow stair tread flooring work to proceed until substrate surfaces are satisfactory.
- D. Vacuum surfaces just prior to installation of treads, risers, and landing surfaces.

3.02 INSTALLATION

- A. Install material in accordance with manufacturer's instructions and recommendations.
 - 1. Select the appropriate, approved adhesive for the application and job conditions.
 - 2. A stair tread is to be placed at the edge of each landing at the top of the stairs.
- B. Tightly bond treads, risers and flooring to substrate throughout length of each piece, with continuous contact at surfaces.
- C. Roll treads, risers and flooring for complete adhesion.
- D. Promptly remove any excess adhesive.
- E. Rubber Stair Tread Accessories:
 - 1. Provide stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.03 CLEANING AND PROTECTION

- A. Clean up installation area and sweep, vacuum dust or wipe material to remove any dirt, dust or debris.
- B. Keep traffic off stair tread and landings for at least 72 hours after installation.
- C. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until Substantial Completion.

D. When protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean stair treads, risers and landing flooring. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

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. 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.
- B. Pursuant to Section 016000 Product Requirements
- C. Product Data: Manufacturer's technical data for each type of resilient flooring and accessory.
- D. 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.
- E. Verification Samples: Provide three (3) samples, 8" long by width to be furnished of each different color and/or size selected for incorporation into the project.
- F. Maintenance Instructions: Submit two (2) Copies of manufacturer's recommended maintenance practices for Luxury Vinyl Tile flooring and accessories.

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. All accessory products shall meet the requirements for the manufacturer's warranty to be valid.

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. Thereafter, maintain a minimum temperature of 55-degrees F in areas where work is completed. Store luxury vinyl tile flooring materials in spaces where they will be installed for at least 48 hours before beginning installation.
- 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 extra materials from same production run as products installed.
- B. Contractor shall furnish a summary of the quantity of each color and size tile installed.
- C. Furnish an extra 3% of each tile type, size, and color in clean marked containers for Owner's use.

1.10 WARRANTY

- A. Provide manufacturer's standard commercial limited warranty.
 - 1. Limited Warranty Period: 20 years.
 - 2. Install product using the appropriate manufacturer's "Flooring Guaranteed Installation System".
- B. The Limited Warranty 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 the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 LUXURY SOLID VINYL TILE

- A. Manufacturer
 - 1. Mannington Commercial.
 - 2. Architect approved equivalent with a minimum 40 mil wear layer.
- B. Products.
 - 1. LVT-1
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1) Amtico Signature Collection Abstract
 - b. Module Size: 12" x 18"
 - c. Thickness: 0.098" (2.5 m)
 - d. Wear Layer Thickness
 - e. Color: Etch Sienna (AR0AET13)
 - 2. LVT-2
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1) Amtico Signature Collection Abstract
 - b. Module Size: 12" x 18"
 - c. Thickness: 0.098" (2.5 m)
 - d. Wear Layer Thickness
 - e. Color: Stitch Stoneware (AR0AST51)
 - 3. LVT-3
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1) Amtico Signature Collection Abstract
 - b. Module Size: 12" x 18"
 - c. Thickness: 0.098" (2.5 m)
 - d. Wear Layer Thickness
 - e. Color: Stucco Nutmeg (AR0AUC89)

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. Comply with manufacturer's product data, including technical bulletins, product catalog, written installation instructions, and product carton instructions for installation and maintenance procedures..
- 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. Roll with a 100-pound roller in the field areas. Hand roll luxury vinyl tile flooring at perimeter of each covered area to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.

- G. 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.
- H. 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.

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. Rubber Floor Tile.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2017.
- C. ASTM D2240 Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).
- D. ASTM D3389 Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader); 2021.
- E. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- F. 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; 2018a.
- G. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.
- H. ASTM E492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine; 2009, with Editorial Revision (2016).
- I. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).
- J. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2021a, with Editorial Revision.
- K. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- L. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- M. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2022.
- N. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

- O. ASTM F386 Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces; 2017 (Reapproved 2022).
- P. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2021.
- Q. ASTM F925 Standard Test Method for Resistance to Chemicals of Resilient Flooring; 2013 (Reapproved 2020).
- R. ASTM F970 Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.
- S. ISO 9001 Quality Management Systems Requirements; 2015.
- T. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.
- 1.04 ACTION SUBMITTALS
 - A. Product Data: For each type of product indicated.
 - B. Provide a copy of the manufacturer's (OEM)'s ISO 9001 certificate.
 - C. Shop Drawings: Show installation details and locations of the following1. Floor patterns / seaming locations.
 - D. Samples for Verification: For each type, color, and pattern of flooring indicated, 6-inch (150-mm) square Samples of same thickness and material indicated for the Work.

1.05 QUALITY ASSURANCE

- A. Manufacturer ISO 9001 certification.
- B. Manufacturer must have a minimum of fifteen (15) years of experience in the manufacturing of prefabricated resilient rubber flooring.
- C. Manufactured Product must have undergone a vulcanization process; factory lamination will not be accepted as equivalent.
- D. Installer Qualifications: Project Managers or Field Supervisors must be INSTALL (International Standards & Training Alliance) certified CFI (Certified Floorcovering Installers) Certified and/or an FCICA (The Flooring Contractors Association) CIM (Certified Installation Manager) for the requirements of the project.
- E. Surfacing Contractor and their workers shall be certified and approved by the approved flooring Manufacturer.
- F. Surfacing Contractor shall be fully acquainted with the existing facility and utilities and shall fully understand the difficulties and restrictions attending the execution of the work under contract.
- G. Surfacing Contractor to advise the Owner of any restrictions or anticipated difficulty, in writing and prior to submitting their bid.
- H. Contractor and their installers shall have performed installations of the similar scale in the last three (3) years.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Resilient Athletic flooring Installer.
- B. Provide Manufacturer's current printed substrate surface preparation guidelines.
- C. Provide Manufacturer's current printed installation guidelines for Products supplied under this contract.

1.07 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include maintenance data and guidelines for flooring materials in maintenance manuals.
- 1.08 MAINTENANCE MATERIAL SUBMITTALS
 - A. Furnish extra materials, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sheet Flooring: Furnish one full-width roll of each pattern of each type, color, and pattern of flooring installed.
 - 2. Provide extra stock materials from original dye lots, for use in facility operations and maintenance (approximately 2% of the total floor surface for each color, surface texture and format of Manufactured Product specified).

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration. Replace any damaged materials with new matching materials in a timely fashion, so that the project is not delayed. Store rolls upright.
- C. Materials must be delivered to site a minimum of 24 hours before work is scheduled to begin so that they may acclimate.
- D. Avoid storing Manufactured Product for extended periods of time or additional material trimming may be required.
- E. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C). Maintain relative humidity at service levels, or between 40% and 65% RH.

1.10 FIELD CONDITIONS

- A. Adhesively Applied Products:
 - Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 - 2. After post installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
 - 3. Test floors for appropriate moisture levels required by the manufacturer prior to commencing any flooring installations.
 - 4. Close spaces to traffic during flooring installation.

- 5. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
- B. Install flooring after other finishing operations, including painting, have been completed.

1.11 COORDINATION

A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.12 WARRANTY

- A. The resilient athletic flooring is warranted to be free from manufacturing defects for a period of one (1) year from the date of Substantial Completion.
- B. For standard applications, the resilient athletic flooring is warranted against excessive wear under normal usage for a period of ten (10) years from the date of Substantial completion.

PART 2 - PRODUCTS

2.01 RUBBER FLOOR TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Flexco Tuflex Rubber Flooring; Flexco Corporation.
 - 2. Mondo America Inc.
 - 3. Roppe Corporation.
 - 4. Architect approved equivalent.
- B. Description: Athletic flooring consisting of modular rubber tiles with smooth edges for adhered application.
- C. Material: Recycled-rubber compound (92 percent post-consumer, 7 percent rapidly renewable content and 100% recyclable). Phthalate, chlorine and halogen-free. Made in the USA. Crumb Rubber-free. PVC-free.
- D. Traffic-Surface Texture: Nondirectional, stipple texture.
- E. Size: Manufacturer's standard-size square tile..
- F. Installation: Glue Down.
- G. Thickness: 3/8 inch.
- H. Weight: Not less than 10 lbs. per tile.
- I. Static Coefficient of Friction; > 0.8; ASTM D2047.
- J. Critical Radiant Flux; Class 1, > 0.45 W/cm2; ASTM E648, NFPA 253.
- K. Smoke Density; Passes, < 450; ASTM E662, NFPA 258.
- L. Static Load Limit; Passes 250 PSI; ASTM F970.
- M. Shock Absorption: Passes Class 1, ASTM F2569.

- N. Acoustical (Impact Insulation Class) Impact; IIC 52 (6" concrete, no drop ceiling), 67 IIC (6" concrete, with drop ceiling); ASTM E492.
- O. Acoustical (Sound Transmission Class) STC 52 (6" concrete, no drop ceiling), STC 63 (6" concrete, with drop ceiling): ASTM E90.
- P. Colors and Patterns: As selected by the Architect from the manufacturer's offerings and designations.
- Q. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; and for use where flooring corners and edges do not abut vertical surfaces.
- R. Moisture Mitigation: Moisture testing is required for all Tuflex Force Rubber Tile installations. Mitigation should be performed if results indicate high levels of moisture. Recommended Moisture Mitigation Product:
 - Excelsior MM-100, Moisture Mitigation provided by Flexco 1
 - a. Unit Size: 2.5 Gallons
 - b. Coverage: 1000 square feet per unit (one coat).
 - MM-100 is a water, solvent and VOC free, polyurethane-based moisture mitigation C. product used to treat concrete slabs with excessive moisture levels beyond what flooring adhesives allow.
 - d. MM-100 can block moisture up to 20 lbs. MVER or 99% RH.
- S. Substrate Preparation Products: Substrates should be prepared to properly receive the resilient flooring products being specified. Trowelable leveling and patching compounds that are latex-modified, Portland cement based or blended hydraulic cement based formulation. **Recommended Substrate Preparation Products:** 1
 - Excelsior NP-230, Non-Porous Substrate Primer provided by Flexco
 - a. Unit Size: 2.5 Gallons
 - b. Coverage: 1000 Square Feet per unit with one coat
 - Used over MM-100 to promote adhesion of cementitious materials C.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 - Verify that finishes of substrates comply with tolerances and other requirements specified 1. in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of flooring.
- B. Ensure that concrete slabs, on or below grade, are installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010 in).

- C. Ensure that no concrete sealers or curing compounds have been applied to or mixed into the concrete.
- D. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of the concrete (normal density concrete curing time is approximately 28 days for development of design strength, having a minimum 3500 psi or 25 MPa in compressive strength).
- E. Ensure that concrete surface is free of any contaminant that could inhibit bond (paint, wax, dust, oil or grease, sealer, curing compound, solvent, asphalt, old adhesive residues, etc.). All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.
- F. Confirm concrete has a smooth finish, proper density and is highly compacted with a tolerance of 1/8th of an inch in a 10-foot radius.
- G. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
 - 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform tests so that each test area does not exceed 200 s.f., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
 - c. Perform relative humidity test using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- H. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- I. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- J. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until they are same temperature as space where they are to be installed.
- K. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.
- L. Proceed with installation only after unsatisfactory conditions have been corrected.
- M. Ensure room and substrate temperatures are maintained prior to moisture testing and flooring installation, during the flooring installation, as well as a minimum of 48 hours after the flooring has been completely installed. Recommended ambient temperature range is between 65 degrees F and 86 degrees F and recommended ambient humidity range is between 35% and 55%.

- N. If installing over wood substrates, ensure exterior grade plywood with at least one good side, such as: APA (Engineered Wood Association) Exterior grade plywood (A-A Exterior, A-B Exterior or A-C Exterior). There must be proper underfloor ventilation, plywood must be dry and should have a moisture content ranging between 6 and 12%, when measured with a quality wood moisture meter (electronic hygrometer).
- O. Installation of resilient athletic flooring shall be permitted to commence only after the building is enclosed and all other trades have completed their work. It is the General Contractor or Construction Manager's responsibility to ensure that a secure and clean working area is maintained before, during and after the installation of the resilient athletic flooring.

3.03 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use non-permanent, nonstaining marking device.
- E. Install tapered transition edges at exposed edges of tile installations and at all door openings.
- F. Install all accessories following Manufacturer's current printed guidelines.
- G. Line Marker to paint all lines following Manufacturer's current printed guidelines, respecting the drawing(s) and the Master Specification.

3.04 REPAIRS

- A. Repair material must come from the same original dye lot as the Manufactured Product initially installed.
- B. When required, Repairs are to be performed by Surfacing Contractor's qualified installers/technicians only.

3.05 CLEANING AND PROTECTING

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.
 - 2. Sweep and vacuum flooring thoroughly.
 - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Always wait at least a minimum of 72 hours after the resilient athletic roll flooring has been completely installed before performing initial maintenance. Always maintain the resilient athletic flooring following Manufacturer's current printed guidelines.
- C. For surfaces having received newly painted lines, wait a minimum of 30 days after the application of the paint to ensure its proper curing before going over the surface with a scrubber/scrubbing the lines.

- D. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.
- E. Preserve the integrity of the installation and protect against direct sunlight/UV exposure; always ensure that windows and glass doors have inherent UV protection and/or are fitted with blinds/ UV film.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Epoxy floor coating system with integral cove base.
- B. Surface preparation.

1.02 REFERENCES

- A. ASTM D1044 Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser; 2019.
- B. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2022.
- C. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- D. ASTM D3363 Hardness Testing.

1.03 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- B. Manufacturer's Installation Instruction: Indicate special procedures and perimeter conditions requiring special attention.
- C. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
- D. Upon request, provide 3 inch x 3 inch sample demonstrating floor color, texture and thickness and a six inch long cove base sample of the approved product selection.

1.04 QUALITY ASSURANCE

- A. 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.
- B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
- C. A pre-installation conference shall be held between Applicator, General Contractor and the Owner's Representative to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.
- D. Manufacturer of Approved System shall be single source and made in the USA.

1.05 DELIVERY, STORAGE AND HANDLING

- A. 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.
- B. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

- C. Store materials for three days prior to installation in area of installation to achieve temperature stability.
- D. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Owner's Representative or other personnel working with or around the material.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature required by manufacturer three days prior to, during and 24 hours after installation of materials.

1.07 WARRANTY

- A. Provide 5-year manufacturer's warranty.
- B. Warranty: Include coverage against flooring delamination from substrate and degradation of surface finish.

1.08 MAINTENANCE DATA

- A. Submit maintenance data.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface and suggested schedule for cleaning.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design: Dur-A-Quartz, Epoxy-based seamless flooring system as manufactured by Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802
- B. Resuflor™ Deco Quartz as manufactured by Sherwin Williams.
- C. Herculan IG as manufactured by Action Floor Systems, LLC.

2.02 MATERIALS

Β.

A. Primer: Dur-A-Flex, Inc, Dur-A-Glaze #4 WB resin and hardener.

| 1. | Percent Solids | 56 % |
|-----|--|---------------------------|
| 2. | VOC | 2 g/L |
| 3. | Bond Strength to Concrete ASTM D 4541 | 550 psi, substrates fails |
| 4. | Hardness, ASTM D 3363 | 3H |
| 5. | Elongation, ASTM D 2370 | 9 % |
| 6. | Flexibility (1/4: Cylindrical mandrel), ASTM D 1737 | Pass |
| 7. | Impact Resistance, MIL D-2794 | >160 |
| 8. | Abrasion Resistance ASTM D 4060, CS17 wheel, 1,000 g | 30 mg loss |
| Bro | adcast and Grout Floor Coating: 100% solids epoxy resin. | |
| 1. | VOC | 3.8 g/L |
| 2. | Compressive Strength, ASTM D 695 | 17,500 psi |
| 3. | Tensile Strength, ASTM D 638 | 2,100 psi |
| 4. | Flexural Strength, ASTM D 790 | 5,100 psi |
| 5. | Abrasion Resistance, ASTM D 4060 | |
| ~~~ | 000740 0 | |

| C-10 Wheel, 1,000 gm load, 1,000 cycles |
|---|
|---|

- 6. Flame Spread/NFPA-101, ASTM E 84
- 7. Impact Resistance MIL D-24613
- 8. Water Absorption. MIL D-24613
- 9. Pot life @ 70 F

29 mg loss Class A 0.0007 inches, no cracking or delamination Nil 20 minutes

- C. Aggregate: The quartz aggregate shall be Dur-A-Flex, Inc. Q-28 or Q-11 colored quartz aggregate, ASTM D451, manufactured by 3M Company or approved equal; color as selected by Architect from manufacturer's full line.
- D. Aggregate: Acrylic color chips. Colors to be selected by the Architect from the manufacturer's full color offering. Chip size shall be as selected by the Architect.
- E. Grout Coat: Dur-A-Flex, Inc. Dur-A-Glaze #4 resin and Water Clear hardener.
- F. Top Coat Dur-A-Flex Poly-Thane 2 or Armor Top (Sherwin Williams GP4638 Urethane Seal Coat for the Sherwin Williams system).

| - | | |
|----|---|-------------------|
| 1. | Percent Solids | 95 % |
| 2. | VOC | 0 g/L |
| 3. | Tensile Strength, ASTM D 2370 | 7,000 psi |
| 4. | Adhesion, ASTM 4541 | Substrate Failure |
| 5. | Hardness, ASTM D 3363 | 4H |
| 6. | 600 Gloss ASTM D 523 | 70 |
| 7. | Abrasion Resistance, ASTM D4060 | Gloss Satin |
| | CS 17 wheel (1,000 g load) 1,000 cycles | 4 8 mg loss/grit |
| | | 10 12 mg loss |
| | | without grit |
| 8. | Pot Life, 70 F, 50% RH | 2 Hours |
| 9. | Full Chemical Resistance | 7 days |
| | | |

- G. Patch Materials
 - 1. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze # 4 Cove-Rez.
 - 2. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Dur-A-Crete

2.03 ACCESSORIES

- A. Primers and Fillers: Waterproof; types recommended by flooring manufacturer.
- B. Expansion Joints/Joint Fillers: Types recommended by flooring manufacturer for specific application.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
 - B. Verify that surfaces are smooth and flat with maximum variation of 1/4 inch in 10 feet, and are ready to receive work.
 - C. Verify concrete floors have cured a minimum of 28 days, are dry to a maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization or dusting.

3.02 PREPARATION

- A. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
- B. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - 1. Perform anhydrous calcium chloride test ASTM F1869. Application will proceed only when the vapor/moisture emission rates from the slab is less than and not higher than 20 lbs/1,000 sf/24 hrs.
 - 2. Perform relative humidity test using is situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
 - 3. If the relative humidity exceeds 75% then Dur-A-Flex, Inc Dur-A-Glaze MVP Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.
- C. 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.
- D. Mechanical surface preparation
 - 1. 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.
 - 2. 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.
 - 3. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
 - 4. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
- E. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.
- F. Vacuum clean substrate.
- G. Apply primer as per manufacturer's recommendations.

3.03 INSTALLATION FLOORING

- A. Apply floor coating system in accordance with manufacturer's instructions. Form integral ¼ inch radius cove base 6 inches high with same materials as floor coating. Apply four finish coats minimum and spread aggregate uniformly in accordance with the manufacturer's instructions.
- B. The system shall be applied in seven distinct steps as listed below:
 - 1. Substrate preparation
 - 2. Priming
 - 3. First broadcast coat application with first aggregate broadcast
 - 4. Second broadcast coat with second aggregate broadcast
 - 5. Grout coat application, sand floor (if required)
 - 6. First topcoat application

- 7. Second topcoat application
- C. Install expansion joints and/or joint filler as per manufacturer's instructions.
- D. The finish floor will have a nominal thickness of 1/8 inch.

3.04 PROTECTION OF FINISHED WORK

- A. Protect finished work until work is complete. 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.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.
- C. Barricade area to protect flooring until fully cured.

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 carpet tile, including transition strips to other floorings.
- B. This Section includes carpet tile with sound absorbing backing, including transition strips to other floorings.
- C. This Section also includes carpet tile installed on access flooring.
- D. Related Sections include the following:
 - 1. Section 033500 Concrete Finishing.
 - 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. The American Association of Textile Chemists and Colorists (AATCC).
 - 1. AATCC TM16 "Test Method for Colorfastness to Light".
 - 2. AATCC TM134 "Test Methods for Electrostatic Propensity of Carpets".
 - 3. AATCC TM174 "Antimicrobial Activity Assessment of New Carpets".
- C. ASTM D2859 "Standard Test Method for Flammability of Finished Textile Floor Covering Materials".
- D. ASTM D6859 "Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings.
- E. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials".
- F. ASTM E90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".
- G. ASTM E413 "Classification for Rating Sound Insulation".
- H. ASTM E492 "Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine".
- I. ASTM E648 "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source".
- J. The Carpet and Rug Institute (CRI) CRI 104 "Standard for Installation of Commercial Carpet".
- K. NFPA 253 "Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source".
- L. ISO (the International Organization for Standardization):

1. ISO 2551 - "Textile Floor Coverings and Textile Floor Coverings in Tile Form -Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions and Distortion Out of Plane".

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements
- C. Product Data:
 - 1. For each style and pattern of carpet tile indicated, provide manufacturer's written data on physical and performance characteristics including: radiant flux classification, durability, emissions, electrostatic properties and fade resistance.
 - 2. Adhesives including VOC content.
 - 3. Transition and termination strips.
- D. Shop Drawings: Provide room layout drawing indicating tile layout, color /style of carpet tile, transition details to other flooring materials.
- E. Verification Samples: For selected colors and patterns, provide two samples of each different carpet tile manufacturer, product, trade name, series, texture, pattern, and color. Size of each: 12 in. by 12 in. minimum.
- F. Qualifications Data: Provide certification installer meets the requirements as stated in the Quality Assurance paragraph below.
- G. Maintenance Instructions:
 - 1. Carpet tile manufacturer's published maintenance instructions.
 - 2. Include methods for maintaining carpet tile, including cleaning and stain removal recommended products and procedures.
- H. Sample Warranty: Provide sample special warranty as specified in this Section.

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. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements or an Installer certified by the carpet tile manufacturer.
- C. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2 of this Specification, as determined by testing identical products per ASTM E648 by an independent testing and inspection agency acceptable to authorities having jurisdiction.

1.06 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 carpet manufacturer's specified range. Thereafter, maintain carpet manufacturer's specified environmental conditions.

1.07 MANDATORY TESTING

- A. Hardened concrete to receive carpet shall be tested using anhydrous calcium chloride test for measurement of vapor emissions.
 - 1. Three (3) tests shall be required for 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. Carpet tile 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.

1.08 EXTRA MATERIALS

- A. Furnish extra materials from same production run as products installed.
- B. Furnish to Owner an additional Twelve (12) carpet tiles of each different color selected and one (1) full gallon of adhesive, unopened.

1.09 WARRANTY

- A. Manufacturer's written warranty in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling and zippering, snags, runs, loss of tuft bind strength, backing integrity-delamination, excess static discharge, abrasive wear, and delamination.
 - 3. Warranty Period: Lifetime Commercial Warranty.

PART 2 PRODUCTS

2.01 CARPET TILE

- A. Manufacturers:
 - 1. Patcraft (a Shaw Industries Group, Inc. company), 616 East Walnut Ave., Dalton. GA 30720. Phone: 800-241-4014.
 - 2. or approved equal

B. CPT-1

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:
 - a. Manufacturer: Patcraft
 - b. Product: Restorative, I0626
 - c. Color: Sage
 - d. Construction: Multi-Level Pattern Loop
 - e. Size: 24 inch x 24 inch
 - f. Dye Method: 100% solution dyed
 - g. Installation: Direct glue with manufacturer's recommended adhesive.
 - h. Pattern: Brick
- C. CPT-2
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:
 - a. Manufacturer: Patcraft

- b. Product: Suburban Abstract I0516
- c. Color: Sage
- d. Construction: Multi-Level Pattern Loop
- e. Size: 24 inch x 24 inch
- f. Dye Method: 100% solution dyed
- g. Installation: Direct glue with manufacturer's recommended adhesive.
- h. Pattern: Brick

2.02 ACCESSORIES

- A. Adhesives: As recommended by carpet tile manufacturer for substrate, location, and installed conditions.
- B. Base and transitions: Required by carpet tile manufacturer and by installation conditions for finishing exposed edges, access panel edges, and transitions between carpet tile and other flooring materials.
 - 1. Resilient and Metal Transitions: See drawings for specific transition requirements.

PART 3 EXECUTION

3.01 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. Install vapor reduction membrane in accordance with Specification Section 090561.13.

3.02 INSTALLATION

- A. Commencement of installation implies that:
 - 1. Substrate has been tested and results are acceptable pursuant to CRI 104 and carpet manufacturer's published instructions.
 - 2. Installation components and accessories are compatible with site conditions pursuant to carpet tile manufacturer's published instructions.
 - 3. Ambient environmental conditions are satisfactory pursuant to CRI 104 and carpet tile manufacturer's published instructions.
- B. Pursuant to carpet tile manufacturer's published instructions and CRI 104, Section 14, "Carpet Modules".
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves and similar openings.
- F. Install free of spots, dirt, or soil; without tears, fraying, raveling, or other defects or damage.

3.03 DIRECT GLUE-DOWN INSTALLATION

- A. Apply adhesive and spread at coverage rate per manufacturer's instructions.
- B. Test for complete contact of adhesive to carpet, backing and floor surface.
- C. Directional and/or pattern tile shall be installed in directions approved by the Architect.
- D. Install free of buckles and ripples.
- E. Ensure proper seam execution using materials and methods pursuant to carpet tile manufacturer's published instructions.
- F. Protect from foot traffic for 48 hours after installation.

3.04 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations".
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.
- D. Perform Final Cleaning in accordance with Section 017423 Cleaning.

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. Vinyl wall covering.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch (914-mm) long in size.
 - 1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat.
- C. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to Ten (10) percent of amount installed.

1.07 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.08 WARRANTY

A. Manufacturer's Warranty: Five (5) years against manufacturing defects.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. 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: 20 or less.
 - b. Smoke-Developed Index: 45 or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 286.
- B. Environmental and Health:
 - 1. Materials shall be free of the following:
 - a. Cadmium
 - b. Mercury
 - c. PBDE (Brominated Fire Retardants)
 - d. PFOA (Perfluorooctanoic Acid)
 - e. DEHP plasticizers.

2.02 VINYL WALL COVERING (WC-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by 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. Momentum
 - 2. Wolf-Gordon.
 - 3. Architect approved equivalent.
- C. Product Style(s) / Series: Symphony
- D. Model Number(s): AZ53818SH
- E. Color Selection(s): Scarlet
- F. Material: Vinyl
- G. Total Weight: 20.0 oz. per linear yard, excluding coatings.
- H. Width: 54 inch.
- I. Backing: Woven, Osnaburg.
- J. Repeat: Reverse Random and 24 inches vertical x 54 inches horizontal
- K. Recycled Content: 10 percent.

- L. Treated with antimicrobial for resistance to mold and mildew. Material shall be Bleach cleanable and withstand hospital-grade cleaners and disinfectants.
- M. Flame Resistance: Class A per ASTM E84.
- N. Flame Spread: 20.
- O. Fire Rating: Passes NFPA 286.
- P. Cleaning Code: Diluted Bleach Solution.
- Q. Hanging Information: Straight Hang / Straight Match.
- R. Sustainability:
 - 1. Low emitting-passes Cal 01350 standard (LEED EQ 4.2) and Free of PFC/PFOA/PFOS, conflict minerals, heavy metals, phthalates(BBP, DBP, DEHP, DIDP, DINP, DnHP, DnOP).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects. Gypsum Board finish Level: 5 prior to application.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Metals: If not factory primed, clean and apply primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 5. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.03 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.1. For solid-color, even-texture, or random-match wall coverings, reverse every other strip.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Match pattern 72 inches (1830 mm) above the finish floor or as recommended by the manufacturer for each material,
- F. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches (150 mm) from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.04 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Section specifies decorative pre-finished panel with pre-engineered hardware trim system. Mounting of panels is to be executed with adhesive and no exposed fasteners. The division or joinery trim is available in a variety of decorative and functional options.
 - 1. Wood Veneer on fiber board substrate panels.
 - 2. High-Pressure Laminate (HPL) on fiber board substrate panels.
 - 3. Hardware.

1.02 REFERENCE STANDARDS:

- A. ANSI A208.2 Medium Density Fiberboard (MDF) for Interior Applications.
- B. Architectural Woodwork Institute (AWI): Architectural Woodwork Standards, 2nd Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Locate trim members to ensure panel lines coordinate with doors, headers, jambs, and other discontinuities in walls.

1.04 SUBMITTALS

- A. Make submittals in accordance with Section 013300 SUBMITTALS.
- B. Product Data: Manufacturer's standard specifications and descriptive literature, including:
 - 1. Product characteristics.
 - 2. Safety Data Sheets (SDS) for adhesives, sealants, and other pertinent materials prior to delivery to site.
- C. Samples:
 - 1. Samples for Selection: Submit manufacturer's standard color and pattern selection samples representing manufacturer's full range of available colors and patterns.
 - 2. Samples for Verification: Submit sample for each component and for each exposed finish required, prepared on samples of size indicated below complete with exposed molding and trim samples.
 - a. Ensure samples indicate type, finish and color specified.
 - 1) High-Pressure Laminate (HPL) sample chip by HPL manufacturer of choice.
- D. Manufacturer's written instructions, including:
 - 1. Delivery, storage, and handling recommendations.
 - 2. Preparation and installation recommendations.
- E. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- F. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
- G. Warranty: Fully executed, issued in Owner's name and registered with manufacturer, including:
 1. Manufacturer's 30-day warranty covering defects in materials.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Supply maintenance data for framed decorative panel system for incorporation into manual specified in Section 017800 CLOSEOUT SUBMITTALS.
- B. Record Documentation: In accordance with Section 017800 CLOSEOUT SUBMITTALS.
 - 1. List materials used in framed decorative panel system work.
 - 2. Warranty: Submit warranty documents specified.

1.06 QUALITY ASSURANCE

A. Installer: Experienced in performing work similar to work of this Section.

1.07 DELIVERY, STORAGE & HANDLING

- A. Deliver materials in accordance with manufacturer's written instructions.
 - 1. Deliver materials on strong pallets in manufacturer's original, unopened, undamaged containers with identification labels intact and product name and manufacturer clearly visible and in sizes to suit project.
 - 2. Inspect each package for damage and promptly contact Marlite, Inc. directly to report damaged packages or missing components
- B. Store materials in manufacturer's unopened packaging until ready for installation.
 - 1. Maintain temperature range of 60° to 80°F and humidity range of 35 to 55 % during storage, installation, and product life cycle.
 - 2. Maintain plastic or other protective wrap in place during on site handling until ready for installation.
 - 3. Keep panels clean and do not stack panels after removal of protection.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

- A. Do not use wood or fiber board products in kitchens, rest rooms, or other high humidity areas.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits in accordance with manufacturer's written recommendations for optimum results.
 - 1. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official.
 - 1. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Marlite®, Inc.: Contact Information: 1 Marlite Drive, Dover, Ohio 44622; Phone: (330) 343-6621, Phone: (800) 377-1221; FAX: (330) 343-7296; Email: info@marlite.com; Website: www.marlite.com.
 - 1. Acceptable Material: Marlite® Sieva™ Large Panel Wall System.
 - 2. Architect approved equivalent.
 - 3. See Section 012500 PRODUCT SUBSTITUTION PROCEDURES for Substitution Requests.

2.02 PERFORMANCE REQUIREMENTS

- A. Burn Characteristics to ASTM E84, Class A.
 - Flame spread: 0-25.
 Smoke Developed 0-450.

2.03 DESCRIPTION

A. Sieva[™] Large Panel Wall System incorporating Wood Veneer and HPL.

2.04 HARDWARE

- A. Panel (Reveal) Trim: Aluminum profiles in 8' lengths.
 - 1. Reveal: (Reveal options:)
 - a. Horizontal: LP551 Slim Reveal 1/16 inch.
 - b. Vertical: LP551 Slim Reveal 1/16 inch.
 - 2. Edge and Inside Corner: LP570 Edge Cap ½ inch and LP580-A Edge Receiver and LP580-B Edge Batten ½ inch
 - 3. Outside Corner: LP560 Outside Corner ½ inch face elements.
- B. Hardware and Trim Material:
 - 1. Aluminum Heavy weight extruded aluminum 6063-T5 alloy and factory pre-finished.
 - 2. Exposed aluminum: Clear satin anodized.

2.05 PANELS

- A. Panel Face Dimensions: Nominal as indicated on the drawings.
- B. Panel Thickness: Nominal ¹/₂ inch.
- C. Wood Fiber Substrate (backerboard): Medium density wood fiberboard, 1/2 inch, conforming to ANSI A208.2, industrial-grade MDF or other wood fiber substrates 82% minimum recycled wood waste] [and having no added formaldehyde].
 - 1. Grain direction: Horizontal, Vertical, or as selected by the Architect..
 - 2. Acceptable Material: Marlite Sieva[™] Large Panel Wall System or Architect approved equivalent.
- D. High Pressure Laminate Panels: Vertical grade high pressure plastic laminate adhered to wood fiber substrate.
 - 1. Edges: Square cut. Panels require field kerf cut for use with LP551 Slim Reveal 1/16-inch Trim. Panels require field dado cut for use with LP552 Narrow Reveal ¹/₄-inch Trim.
 - 2. Balancing Backer: Kraft paper that does not contribute to or pose additional fire hazard.

- 3. Color and pattern: As selected by the Architect from the manufacturer's full species and cut offering..
- 4. Acceptable Material: Marlite Sieva[™] High Pressure Laminate Large Panel Wall System or Architect approved equivalent.

2.06 ACCESSORIES

- A. Adhesives: Solvent based low VOC adhesive.
- B. Specifier Note: Marlite Brand C109 adhesive is recommended for the installation of Sieva[™]. Marlite Brand C-109 adhesive is a solvent based material, and local code restrictions may require substitution. Any adhesive substitution must have the manufacturer's approval.
- C. Acceptable Material: Marlite C-109 Solvent Based Adhesive.

2.07 FABRICATION

- A. Ensure framing panels, hardware and accessories are factory finished and ready to install except for field fabrication as required at work site and perimeter conditions.
 - 1. Refinish field cut panel edges in accordance with manufacturer's instruction before installation.
 - 2. Drill corners for cut-outs 1/8-inch radius minimum.

PART 3 EXECUTION

3.01 INSTALLER

A. Use only installers who have training and experience of work similar to the work of this Section.

3.02 EXAMINATION

- A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for framed decorative panel system installation in accordance with manufacturer's written recommendations.
 - 1. Visually inspect substrate in presence of Architect.
 - 2. Ensure substrate is smooth, sound, clean, dry, and free of contaminants and other deleterious materials.
 - 3. Ensure vapor barrier has been provided on exterior walls behind backing to prevent warping.
 - 4. Ensure backing panels are smooth, solid, and flat and that drywall joints are taped and finished.
 - 5. Ensure walls are primed before installation begins.
 - 6. Ensure mechanical, electrical, and building service or items affecting work of this section are placed and ready to receive this work.
 - 7. Ensure stud spacing does not exceed 24 inches.
 - 8. Inform Architect of unacceptable conditions immediately upon discovery.
 - 9. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Architect.
 - 10. Starting installation of framed decorative panel system implies substrate conditions are acceptable for work of this section.
- B. Ensure structural walls are finished and building is completely closed with walls thoroughly dry before starting installation.

3.03 PREPARATION

- A. Conditioning: Allow panels to acclimate to balanced environment in installation location for 72 hours minimum before and during installation.
 - 1. Maintain environmental conditions of 60° to 80° F and 35% to 55% humidity in installation location for 72 hours before and during installation.
- B. Protect existing surfaces with drop cloths.
- C. Except as indicated, before installing, examine panels and arrange to achieve best combination of color, pattern, texture, and grain.
- D. Ensure HVAC system is operable and installation area is balanced to normal operating conditions before proceeding with installation.

3.04 INSTALLATION

- A. Install framed decorative panel system in accordance with manufacturer's written recommendations.
- B. Construct casework to Architectural Woodwork Institute standards, Custom grade and in accordance with Section 064100 Architectural Wood Casework.
- C. Install materials straight, plumb and level in accordance with manufacturer's written instructions.
 - 1. Anchor units tightly and securely in place.
 - 2. Cut sheets to meet existing supports.
- D. Fasten supports and trim using #6 trim-head screws anchored into stud or other solid substrate at 16-inch centers.
 - 1. Where screws do not hit studs, fasten with adhesive in accordance with manufacturer's written recommendations.
 - 2. Pre-drill holes through members and fasten screw flush with flange on aluminum profile.
 - 3. Where necessary countersink for screw head to seat flush with flange.
- E. Avoid contamination of the panel faces with adhesives, solvents, or cleaners during installation.1. Clean up spills immediately.

3.05 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with Section 014500 QUALITY CONTROL.
- B. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.
 - 1. Report any inconsistencies from manufacturer's recommendations immediately to Architect.

3.06 CLEANING

- A. Perform daily progress cleaning.
 - 1. Leave work area clean at end of each day.
- B. Upon completion, remove surplus materials, rubbish, tools, and equipment.

C. Collect recyclable waste and dispose of in accordance with manufacturer's written recommendations and at appropriate recycling facilities.

3.07 PROTECTION

- A. Protect installed framed decorative panel system from damage during construction.
- B. Repair or replace adjacent materials damaged by installation of framed decorative panel system.

END OF SECTION

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 (fire taped) 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 016000 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.
- D. Installation instructions.
- E. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all dis-contintinuities in the wall elevation.
- F. Selection Samples: Submit manufacturer's color and pattern selection samples representing manufacturer's full range of available colors and patterns.
- G. 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.
- H. 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.

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 x 10 ⁴ | ASTM D 790 |
| Flexural Modulus (PSI) | 6.0 x 10 ⁶ | ASTM D 790 |
| Tensile Strength (PSI) | 11.5 x 10 ³ | ASTM D 638 |
| Tensile Modulus (PSI) | 0.45 x 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 (III).
- 3. Nominal Thickness: 0.090 inch nominal.
- 4. Back Surface: SMooth. Imperfections which do not affect functional properties are not cause for rejection.
- 5. Front Finish: Pebbled surface texture.
- 6. Color: As selected by Architect from manufacturer's standard colors.

- B. Accessories and Moldings: One-piece, color integral PVC, color to match plastic panels, 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.

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 manufacturer's recommended sealant to one side of channel trim piece. Install trim piece on leading edge of panel. Apply a continuous bead of manufacturer's recommended 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

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 and staining work is shown on the Contract Drawings and schedules, and as herein specified.
 - 3. The Work includes painting and finishing of all interior and exterior work, except as otherwise indicated. This includes new construction and existing construction with painted surfaces.
 - 4. Special painting items include but are not limited to: exterior steel lintels; exposed ductwork; bare and covered pipes and conduits; special painting of exposed sprinkler piping: and exposed structural steel, metal decking, bar joists 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 033510 Polished Concrete Finishing
 - 2. Section 042200 Concrete Unit Masonry.
 - 3. Division 05 Metals
 - 4. Section 062000 Finish Carpentry
 - 5. Section 079200 Sealants.
 - 6. Section 081113 Hollow Metal Doors & Frames
 - 7. Section 092116 Gypsum Board Assemblies.
 - 8. Division 32 Specifications for exterior, painted traffic markings.

1.03 REFERENCES

- A. Steel Structures Painting Council (SSPC):
 - 1. SSPC-SP1 Solvent Cleaning.
 - 2. SSPC-SP2 Hand Tool Cleaning.
 - 3. SSPC-SP3 Power Tool Cleaning.
 - 4. SSPC-SP5/NACE No. 1, White Blast Cleaning.
 - 5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
 - 6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
 - 7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
 - 8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
 - 9. SSPC-SP12/NACE No.5, Surface Preparation and Cleaning Metals by Waterjetting Prior to Recoating.
 - 10. SSPC-SP13/NACE No. 6 Surface Preparation for Concrete.

1.04 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 D660 "Standard Test Method for Evaluating Degree of Checking of Exterior Paints".
- D. ASTM D661 "Standard Test Method for Evaluating Degree of Cracking of Exterior Paints".
- E. ASTM D714 "Standard Test Method for Evaluating Degree of Blistering of Paints".
- F. ASTM D3170 "Standard Test Method for Chipping Resistance of Coatings".
- G. ASTM D3359 "Standard Test Methods for Rating Adhesion by Tape Test".
- H. ASTM D4214 "Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films".
- I. ASTM D5324 "Standard Guide for Testing Water-Borne Architectural Coatings".
- J. ASTM D6386 "Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting".
- K. EPA-Method 24 "Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings".
- L. OTC (Northeast Ozone Transport Commission) Latest adopted model rules.

1.05 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 decks).
- F. For materials to receive stain & polyurethane provide three (3) samples of each selected stain color on each wood species being used.
- G. Provide Manufacturer Safety Data Specs (MSDS).

1.06 QUALITY ASSURANCE

- A. Experienced workers 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.

1.07 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.

1.08 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. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.
- 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.

H. Perform no final coat painting work unless a minimum lighting level of 30 foot candles is provided on surfaces to be painted.

1.09 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.

1.10 EXTRA STOCK

- A. Provide 1 gallon of each separate finish coat 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.

1.11 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.

1.12 EPOXY WALL 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. Sherwin Williams Company.
 - b. Benjamin Moore & Co.
 - 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 PAINT MATERIALS - GENERAL

- A. Paints and Coatings:
 - 1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
 - 2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

2.03 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.
- C. Provide tinted primers as required for dark colors.

2.04 COATING SYSTEMS

- A. Gypsum board epoxy system (where called for in finish schedule)
 - 1. Sherwin Williams
 - a. Primer: ProMar 200 Zero VOC Primer; MDF 1.5.
 - b. Two coats: Water Based Catalyzed Epoxy; MDF 2.5-3.0.
 - c. Total System: MDF 6.5-7.5.
 - 2. Benjamin Moore
 - a. Primer: Fresh Start® High-Hiding Acrylic Primer (046) MDF 1.4.
 - b. Two Coats: Corotech® Pre-Catalyzed Waterborne Epoxy (V342); MDF 1.5 1.7 per coat.
 - c. Total System: MDF 4.4-4.8.
- B. 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 5.6 5.9.
 - 2. Benjamin Moore
 - a. Drywall Primer: USG Sheetrock Brand First Coat Primer DFT 0.9-1.2.
 - b. Paint Primer: UltraSpec® 500 Interior Latex Primer (N534) Zero VOC; MDF 1.8.
 - c. Two coats: Ultra Spec® 500 Interior Low Sheen-Eggshell (N537) Zero VOC; MDF 1.7 1.9 per coat.
 - d. Total System: DFT 6.1 6.8.

- C. Ferrous metals, shop primed (flat and gloss, solvent base)
 - 1. Sherwin Williams
 - a. Primer: Pro Industrial Pro-Cryl Universal Primer (B66-310); MDF 2.0-4.0.
 - b. Two coats: Pro Industrial Acrylic Semi-Gloss; MDF 2.5 per coat.
 - c. Total System: MDF 6.5 9.0.
 - 2. Benjamin Moore
 - a. Primer: Ultra Spec® HP Acrylic Metal Primer (HP04); MDF 1.7 2.3.
 - b. Two coats: Ultra Spec® HP D.T.M. Acrylic Semi-Gloss (HP29); MDF 1.8 -2.5.
 - c. Total System: DFT 5.3 7.3.
- D. Wood (New), 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: Fresh Start® High-Hiding Acrylic Primer (046) MDF 1.4.
 - b. Two coats: Ultra Spec® 500 Interior Semi-Gloss (T546); MDF 1.5 1.7 per coat.
 - c. Total System: DFT 4.4 4.9.
- E. Wood (New), stained finish (Warm Semi-Gloss)
 - 1. Sherwin Williams
 - a. Primer: Follow manufacturer's instructions for wood grain filler and/or wood conditioner.
 - b. First Coat: Minwax® Wood Finish[™] 250 VOC Compliant Stain (multiple coats if necessary to achieve desired color).
 - c. Second & Third Coat: Minwax® Performance Series Fast-Drying Polyurethane @ 4.0 mils wet, 1.2 1.5 dry per coat.
 - d. Total System: MDF 3.6 4.5.
 - 2. Benjamin Moore
 - a. Primer: Follow manufacturer's instructions for wood grain filler and/or wood conditioner.
 - b. Three Coats: Stay Clear® Acrylic Polyurethane Low Lustre (W423); MDF 1.2 1.6. per coat.
 - c. Total System: MDF 3.6 4.8.
- F. Interior CMU (Paint)
 - 1. Sherwin Williams
 - a. First Coat: Pro Industrial® HD Block Filler (B42W00150); MDF 8.0-10.5.
 - b. Two Coats: ProMar® 200 Zero VOC Eg-shel (B20W12651); MDF 1.6.
 - c. Total System: MDF 11.2-13.5.
 - 2. Benjamin Moore
 - a. First Coat: Ultra Spec® Hi-Build Masonry Block Filler (571); MDF 8.5 11.3.
 - b. Two Coats: Ultra Spec® 500 Interior Eggshell (N538) Zero VOC; MDF 1.8 per coat.
 - c. Total System DFT: 12.1 14.9.
- G. 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: Ultra Spec® Hi-Build Masonry Block Filler (571); MDF 8.5 11.3.

- b. Two Coats: Corotech® Pre-Catalyzed Waterborne Epoxy Semi-Gloss (V341); MDF 1.5 1.9 per coat.
- c. Total System: MDF 11.5 15.1.
- H. Apparatus Bay Ceiling for Exposed Structure and Accessories (except sprinkler piping and other non-insulated metal piping). Surface Prep SSPC-SP1
 - 1. Sherwin Williams
 - a. First Coat: Pro Industrial[™] Waterborne Acrylic Dryfall Eg-shel (B42W00182) MDF 3.0.
 - b. Second Coat: Pro Industrial[™] Waterborne Acrylic Dryfall Eg-shel (B42W00182) MDF 3.0.
 - c. Total System: MDF 6.0 7.5.
 - 2. Benjamin Moore
 - a. First Coat: Benjamin Moore Latex Dry Fall (395); MDF 1.4 2.6.
 - b. Second Coat: Benjamin Moore Latex Dry Fall (395); MDF 1.4 2.6.
 - c. Total System: MDF 2.8 5.2.
- I. 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); MDF: 2.0-4.0.
 - 2. Benjamin Moore
 - a. One Coat: Ultra Spec® Acrylic Metal Primer (HP04); MDF: 1.7-2.3.
- J. 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.
- K. Exposed PVC Piping
 - 1. Sherwin Williams
 - a. One Coat: Extreme Bond™ Primer (B51W00150)
 - b. Two Coats: Pro Industrial[™] Acrylic Eg-Shel (B66-660)
 - 2. Benjamin Moore
 - a. One Coat: InsI-X® Stix® Waterborne Bonding Primer (SXA-110); MDF 1.6 2.1.
 - b. Two Coats: Ultra Spec® EXT Satin Finish (N448); MDF1.5 per coat.
- L. Exposed Sprinkler Piping and other Non-insulated Metal Piping
 - 1. Sherwin Williams
 - a. One Coat: Pro Industrial[™] Pro-Cryl[®] Primer, (B66-1310) MDF 2.0-4.0.
 - b. Two Coats (or more to achieve uniform appearance): Pro Industrial™ Acrylic Semigloss, MDF 2.5 per coat.

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 and requirements listed in this specification adhering to the more stringent requirements.
- 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 PREPARATION

A. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

3.04 CMU PREPARATION

- A. Block (Cinder and Concrete): Remove all loose mortar, foreign material, surface dust, dirt and other contaminants by brooming, air blast, or vacuum cleaner. CMU mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments.
- B. 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.

3.05 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.

3.06 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.
- B. Metals not factory/fabricator primed (i.e. sprinkler pipe).
 - 1. Remove all surface contamination by hand washing with an appropriate cleaner, approved by the paint manufacturer. Rinse thoroughly and allow to dry.
 - 2. Power tool clean per SSPC-SP3 or as recommended by paint manufacturer. Remove all oil and grease from surface per SSPC-SP1.
 - 3. Verify all signs of rust have been properly removed.
 - 4. Apply primer within four (4) hours of surface prep.
 - 5. In areas of dry-fall painting, protect both painted and un-painted sprinkler piping and other ferrous metals scheduled for special painting from dry-fall paint and/or dry-fall paint residue.

3.07 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.

3.08 WOOD SURFACE PREPARATION

- A. Remove oil and grease by using mineral spirits or xylol. Change applicators frequently to avoid recontamination.
- B. Existing Painted Surfaces scheduled to be re-painted:
 - 1. Scrape and sand all existing surfaces removing old and peeling paint.
 - 2. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied.
 - 3. Remove any localized, rotten, dilapidated wood and fill as outlined below.
 - 4. Patch all nail holes, gouges, and imperfections with a wood filler or putty and sand smooth.
 - a. Use exterior grade wood putty in exterior applications.
 - b. Sand and finish smooth to surrounding profile.
 - 5. Check moisture content of existing wood to verify it is within paint manufacturer's guidelines.
 - 6. Apply primer to scraped and sanded areas within four (4) hours.
- C. Seal defects such as knots, resins, gum pockets, or extractives by using a mixture of equal parts of shellac and alcohol.
- D. 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
- E. 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.
- F. Back prime all trim, bases, casing, and finish lumber prior to installation.
- G. Apply two (2) coats of primer on all redwood or cedar where paint will be applied.
- H. Sand and dust as necessary.

3.09 APPLICATION

- A. Beginning of installation means acceptance of existing surfaces.
- B. In areas with extensive electrical, IT, mechanical and/or plumbing equipment mounted on the walls or ceiling, those surfaces shall be painted with a minimum of all primer coats and at least one coat of finish color paint, prior to mounting equipment, conduit, boxes, etc. Final finish paint coat may be applied around surface mounted equipment and panels at Contractor's option. All plywood backer boards shall be painted prior to mounting equipment.
- C. Apply paint pursuant manufacturer's directions. Use applicators and techniques best suited for type of material being applied.
- D. 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.
- E. 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 the ceiling line.
- F. Sand lightly between each succeeding polyurethane, enamel, or varnish coat.
- G. Spray Painting: allowable interiors to be approved by the Architect. Limit spray-painting on interior surface to acoustical plaster (if any), Apparatus bay ceilings, other rooms with unfinished metal deck ceilings, and service spaces such as mechanical equipment rooms.
 1. Dry Fall paint shall be applied with airless spray equipment.
- H. Minimum coating thickness: apply each paint coat at not less than manufacturer's recommended spreading rate.
- I. Prime coats: apply a prime coat(s) if specified to material which is required to be painted or finished, and which has not been prime coated.
- J. 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.
- K. 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.
- L. 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.
- M. 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.
- N. 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, adjacent rooms without a finished ceiling, and any other rooms/corridors/accessible spaces without a finished ceiling. Accessible attics do not apply except if particular items are noted to be painted.
- 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.
 - 4. Paint screw heads used in glazing stops of transom, side-lite, and vision panels to match frame color.
- H. Paint vision glass metal frames in wood doors to match frame color. If door frame color is different on each side of frame, likewise for vision frame.
- I. Paint metal louvers in wood doors to match door frame.
- J. GWB soffits may be painted one color on the horizontal surface and a different color on the vertical surface. Consult Interior Color Schedule.
- K. Paint all steel bollards, overhead door steel jambs and lintels, all exposed steel structure, galvanized decking, conduit, piping, exposed ductwork and framing in the apparatus bay, adjoining rooms, and any other room or corridor without a finished ceiling.
- L. Paint all metal stairs, stringers, guardrails and handrails. If underside of metal stairs and stringers are exposed to view, they shall be painted.
- M. Paint all exterior and interior lintels.
- N. Paint numbers on interior of each overhead door as detailed on Contract Drawings.
- O. Paint any exterior trim that does not have a factory provided finish.
- P. 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.

Contractor's Option: Pre-printed permanent labels may be used in lieu of stenciling. Submit labels for approval prior to installing.

Q. Paint underground storm pipe stub-ups at gutter downspout terminations. Paint transition piece between downspout and underground pipe.

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

H2M

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 surface preparation and application of wood finishes on the following substrates:
 - 1. Interior Substrates:
 - a. Dressed lumber (finish carpentry).
 - b. Exposed wood panel products.

1.03 DEFINITIONS

- A. Flat: Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. Matte: Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. Eggshell: Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. Satin: Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. Semi-Gloss: Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. Gloss: Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. High Gloss: Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.
 - 3. VOC content.

1.05 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

- a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
- b. Other Items: Architect will designate items or areas required.
- 2. Final approval of stain color selections will be based on mockups.
 - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Benjamin Moore & Co.
 - 2. Sherwin-Williams Company (The).
 - 3. Pratt & Lambert.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other PART 2 articles for the category indicated.

2.02 MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 - 2. Shellacs, Clear: VOC not more than 730 g/L.
 - 3. Stains: VOC not more than 250 g/L.
- D. Stain Colors: As selected by Architect from manufacturer's full range.

2.03 WOOD FILLERS

A. Wood Filler Paste: MPI #91.

2.04 PRIMERS AND SEALERS

A. Sanding Sealer: MPI #102

2.05 STAINS

A. Stain, Semi-Transparent, for Interior Wood: MPI #186.

2.06 POLYURETHANE VARNISHES

A. Varnish, Interior, Polyurethane, Oil-Modified, Satin (Gloss Level 4): MPI #57.

2.07 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 13 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Interior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glass like finish.
 - 3. Sand surfaces that will be exposed to view and dust off.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.03 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for finish and substrate indicated.
 - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.04 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.05 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, non-traffic surfaces, including wood-based panel products.
 - 1. Polyurethane Varnish over Stain System:
 - a. Stain Coat: Stain, semi-transparent, for interior wood, MPI #90.
 - b. First Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - d. Topcoat: Varnish, interior, polyurethane, oil-modified, satin (Gloss Level 4), MPI #57.

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 Specifications, apply to work of this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Tack boards
 - 2. Related Accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 061000 Rough Carpentry
 - 2. Section 092116 Gypsum Board Assemblies
 - 3. Section 101123 Glass Enclosed Bulletin Board Cabinet

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. American Society for Testing Materials
 - 1. ASTM E84 "Standard Test Method for Surface Burning Characteristics for Building Materials".
 - 2. ASTM B221 "Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes".
- C. GREENGUARD-Certification from UL Environment
 - 1. Meets GREENGUARD Gold Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.
- 1.04 SUBMITTALS
 - A. Pursuant to Section 013300 Submittal Procedures.
 - B. Pursuant to Section 016000 Product Requirements.
 - C. Product Data: For each type of visual display board indicated. Provide technical data for materials specified.
 - D. Shop Drawings: For each type of visual display board required.
 - E. Samples and color charts: Manufacturer's color charts and composition samples of face, core, backing, and trim to illustrate finish, color and texture, where required.
 - F. Product Certificates: Signed by manufacturers of tack boards certifying that vinyl-fabric-faced cork tackboard materials furnished comply with requirements specified for flame-spread ratings.
 - G. Manufacturer's Installation Instructions.
 - H. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.
- B. Manufacturer Qualifications:
 - 1. Manufacturer shall be a firm engaged in the manufacture of visual display boards in the United States.
 - 2. Manufacturer shall have a minimum of 5 years experience in the manufacture of visual display boards.
- C. Regulatory Requirements: Conforms to applicable code for flame/smoke rating in Tackboards in accordance with ASTM E84.
- D. Product Certifications: Provide GREENGUARD Indoor Air Quality Certified certificate for markerboards and tackboards, as applicable.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of visual display boards with spaces sufficiently complete so that visual display boards can be installed upon delivery.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store materials protected from exposure to harmful weather conditions and at temperatures and humidity conditions recommended by manufacturer.

1.08 WARRANTY

A. Submit a standard warranty, stating that when installed in accordance with manufacturer's instructions and recommendations, Tackboards are guaranteed for five years against defects in materials and workmanship. Warranty does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Aluminum Framed Tack boards
 - a. Claridge Products and Equipment, Inc. (Basis of Design)
 - b. Best-Rite Chalkboard Co.
 - c. Greensteel, Inc.
 - d. Architect Approved Equivalent.

2.02 MATERIALS

- A. Tack Boards
 - 1. Tack board surface: Composed of $\frac{1}{4}$ " thick self healing, burlap backed cork laminated to a $\frac{1}{4}$ " hardboard backing.
 - a. Size: As shown on Contract Drawings.
 - 2. Tack board frame:
 - a. Extruded aluminum trim with satin anodized finish.
 - b. Face width of aluminum frame: Manufacturer's standard not exceeding 1-1/4 inches.
 - 3. Hanging: Concealed mounting

2.03 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch (1.57-mm) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.
 - 1. Structural Support: Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
 - 2. Field-Applied Trim: Manufacturer's standard hanging bar trim, with no visible screws or exposed joints. Hanging bars to interlock with trim.

2.04 FABRICATION

- A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core mate material under pressure with manufacturer's recommended flexible, waterproof adhesive. Provide factory assembled visual display board units.
 - 1. Cut joints straight and true. Space joints symmetrically. Fit and match panels before shipment to provide a continuous uniform writing surface.

2.05 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine wall and/or door surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
 - 1. Surfaces to receive marker boards and tackboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of chalkboards or markerboards.
 - 2. Do not proceed with installation until unsatisfactory conditions have been corrected.

- A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.03 ADJUSTING AND CLEANING

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units according to manufacturer's written instructions.
- C. Provide to owner written recommendations for regular cleaning, stain removal and precautions.

END OF SECTION

2/25/2025 4:18 PM

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 Wall Mounted Back Lighted Letters.
 - 5. Exterior Maltese Cross and/or Medallion.
 - 6. Exterior High-Density Urethane (HDU) Sign
 - 7. Interior Evacuation Route Signs
 - 8. Decal Signage
 - 9. 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 plumbing 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, symbols 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 INTERIOR ROOM SIGNAGE

- 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 and Specialty Signs
 - a. Grafton Data Systems, Inc., 89 Marcus Blvd, Hauppauge, NY 11788. Phone: (888) 437-9993.
 - b. Intelligent Signage, Inc., 2 Hickory St., Holyoke, MA 01040. Phone: 413-409-8195.
 - c. Mohawk Sign Systems, Series 2000-ARCH, P.O. Box 966, Schenectady, NY 12301-0966. Phone: (518) 842-5303.
 - d. Architect Approved Equivalent.
 - 2. All signs shall be manufactured using Graphic Process Sand Carved using Format D.
 - Plastic or metal signs with tactile reflective routed lettering. Raised and Brailled Characters and Pictorial Symbol Signs (Pictograms) 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 ½-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.
- f. Symbols of Accessibility: Facilities and elements required to be identified as accessible by Part 1341.0401 shall use the Modified International symbol of accessibility.
- 3. Sign material shall be melamine plastic laminate, approximately 1/8-inch thick with contrasting core color. The melamine shall be non-static, fire-retardant and self-extinguishing. The plastic laminate shall be impervious to most acids, 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 ³/₄-inch high.
 - c. Symbol size shall be 5-inches high.
 - d. Standard Grade 2 Braille shall be ¹/₂-inch below copy.
- 5. Letterform shall be Gill Sans upper case.
- 6. Copy Position: CC (centered/centered)
- 7. Sign Size:
 - a. Room Function Signs: Size as indicated in Contract Drawings unless text requires a longer sign.
 - b. Restroom Signs; shall be 9-inches x 9-inches with a 5-inch accessibility symbol, gender symbol, and the verbal description placed directly below followed by Grade 2 Braille.
 - c. Corners: Square Edge.
- 8. Stairwell Signage:
 - a. A Floor Level Sign meeting ADA sign requirements with tactile letters and braille installed inside the stairwell and located at each floor level landing next to the door leading from the stairwell into the corridor.
 - b. If there is an exit door from the stairwell leading to the exterior or to the level of discharge exit for the building, there should be an ADA compliant "EXIT" sign with raised characters and braille installed adjacent to the door. Doors leading to exit doors should be identified with "EXIT ROUTE".
 - c. Corridor or hallway doors leading INTO stairwells require ADA compliant tactile and braille signs designating "STAIRS" or the stairwell ID (i.e. STAIR A).

2.02 EXTERIOR LETTERS

- A. Available Manufacturers:
 - 1. Grafton Data Systems, Inc., 89 Marcus Blvd, Hauppauge, NY 11788. Phone: 631-630-9528.
 - 2. Gemini Inc. 103 Mensing Way, Cannon Falls, MN 55009, Phone: (800) 538-8377
 - 3. DCI Signs & Awnings, Newark, NY 07104
 - 4. Architect Approved Equivalent.
- B. Material: Cast Aluminum
 - 1. Specialty Finish as selected by the Architect from the following:
 - a. Dark Bronze Anodized
- C. Size: As shown on Contract Drawings.
 - 1. Letter Height: As shown on Contract Drawings.
 - 2. Letter Depth: As recommended by manufacturer based on letter height (3/4" to 1-1/2").

- 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.

2.03 DEDICATION PLAQUE

- A. Available Manufacturers:
 - 1. United States Bronze, 811 Second Avenue, New Hyde Park, NY 11040 Phone: (800) 872-5155
 - 2. Matthews International Corporation, 2 North Shore, Pittsburgh, PA 15212. Phone: (800) 950-1317.
 - 3. Grafton Data Systems, Inc., 89 Marcus Blvd, Hauppauge, NY 11788. Phone: 631-630-9528.
 - 4. 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 Bronze
 - 1. Lettering, border, texture and background color selected by Architect from manufacturer's full range.
- D. Border:
 - 1. Single Line
 - 2. Double Line
 - 3. Single Line Bevel Edge
- E. Finishes:
 - 1. Background Texture: Leatherette, Pebble, Travertine or Sculptured as selected by the Architect.
 - 2. Surface Finish: Satin Bronze, Polished Finish or Random-Orbital as selected by the Architect.
- F. Size: Minimum 864 Sq. In.
- G. Lettering: Raised, Gill Sans upper case, Size as determined by plaque layout.
- H. Mounting:
 - 1. Verify location with Owner and Architect.
 - 2. Method: Drilled thru to receive screws with rosettes
- I. Names:
 - 1. Fire District Names
 - 2. Fire Department Emblems
 - 3. H2M architects + engineers
 - 4. Construction Management Firm
 - 5. Other individuals and wording to be selected by Owner.
 - 6. Construction Contractors

- J. Bronze Castings: Provide bronze castings, copper alloy UNS C83600, complying with the requirements of ASTM B 584.
- K. Protective Coating: Semi-Gloss Clear Protective Lacquer for Interior or Exterior Applications.

2.04 TRUSS IDENTIFICATION SIGNAGE

- A. Signs identifying the existence of truss construction shall consist of a circle 6" in diameter, with a stroke width of ½ 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: Seven decal type.
- C. Copy: To be furnished

2.05 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. 8 inch high x 10 inches wide, "Maximum Occupancy ##"
 - d. 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 0.008 aluminum.
 - 2) Engineer-grade reflective vinyl overlay.
 - 3) Visible both day and night.
 - e. Four 12 inch x 12 inch, "No Storage Allowed".
 - f. Four 12 inch x 12 inch, "Training Only" furnish with brass screws for exterior mounting.
 - g. Two 12 inch x 12 inch sign "Authorized Personnel Only Not An Exit"
 1) Doors: 122A & M01
 - h. Six 10" x 14" sign "Four-Fold Door Open Storage Zone Keep Clear"
 - i. Floor Level Signs -- In multi-story buildings at stairways provide floor level designation signage.
- B. Interior Evacuation Plan Signage
 - 1. Provide four (4) 18" x 24" building floor plan signs each in a 1-1/2" wood frame stained to match wood door finish suitable for wall hanging.
 - a. Required plan and information to be printed on high quality, heavy stock paper and covered with museum grade glass in the specified wood frame.
 - b. Each sign shall show the building floor plan (partial or full) showing in red, primary path of travel (solid red line) and secondary path of travel (dashed red line) to nearest exit(s) from specific room location.
 - c. All text shall be bold and minimum of 3/4" in height.
 - d. Sign shall be titled "EVACUATION PLAN", Room #, Room Name.

- e. Show with circular yellow and black person graphic or other distinctive emblem "You are here".
- f. Show Fire Alarm Pull Box Locations, Stairways (if applicable), Exits.
- g. Identify fire alarm system's sounds and appearance.
- h. Include: "Emergency Phone Number: 911".
- i. If signage is located on an upper or basement floor include: "Use Stairway for Exit --Do Not Use Elevator".
- j. Floor plan graphics will be furnished by Architect.

2.06 EXTERIOR MALTESE CROSS

- A. Material: Cast Aluminum 2" thick
 - 1. Colors: to be selected by Architect
- B. Size: 48 inch diameter
 - 1. Lettering Style: to be selected by Architect
 - 2. Mounting: Exterior
 - a. Verify location with Architect and Owner
 - b. Method: Mount to brick wall
 - 1) Use projected spacer style mounting

2.07 EXTERIOR WALL MOUNTED WELDED BACK-LIT LETTERS

- A. Available Manufacturers:
 - 1. Grafton Data Systems, Inc., 89 Marcus Blvd, Hauppauge, NY 11788. Phone: 631-630-9528.
 - 2. Gemini Inc. 103 Mensing Way, Cannon Falls, MN 55009, Phone: (800) 538-8377
 - 3. DCI Signs & Awnings, Newark, NJ 07104
 - 4. Architect Approved Equivalent
- B. Material: Aluminum Reverse Channel Letters 2" deep.
 - 1. Faces: 0.090 aluminum.
 - 2. Returns: 0.063 aluminum, welded construction.
 - 3. Backs: 0.150 polycarbonate backs. Mounting and electrical holes to be CNC cut into the polycarbonate backs.
- C. Color: Clear Anodized Class I Aluminum Finish
- D. Size: 18" high
- E. Lettering Style: As selected by the Architect.
- F. Illuminated Text Characters: Blackened aluminum die-cut alphanumeric characters mounted with stand-offs, with backlighted LED lighting including transformers, insulators, and other accessories for operability, with provisions for servicing and concealing connections to building electrical system.
 - 1. UL approved LEDs.
 - 2. Lead wires/cables (10') and power supplies to be included.
 - 3. Use tight or sealed joint construction to prevent unintentional light leakage.
 - 4. Space lamps apart from each other and away from character surfaces as to illuminate evenly.
 - 5. Power: As indicated on Electrical Drawings.
 - 6. Weeps: Provide weep holes to drain water at lowest point of exterior characters.
 - 7. Provide UL labels on bottom of each letter.
 - 8. Warranty:

- a. LED's to include a five (5) year warranty.
- b. Power supplies to include a two (2) year warranty.
- G. Text: As shown on Contract Drawings in all uppercase letters.
- H. Stand-Offs: provide stand-offs to place the letter 1.5" off the wall unless sign fabricator recommends a different stand-off for optimum effect.

2.08 DECAL(S)

- A. Manufacturer:
 - 1. CustomWindowClings, 614 Frelinghuysen Ave., Newark, NJ 07114, <u>www.customwindowclings.com</u>.
 - 2. Architect approved equivalent.
- B. Custom Window Decal
 - 1. Adhesive vinyl, laminated with a UV protective layer and contour cut to size.
 - 2. Inside window application.
 - 3. Diameter: 60" will required two-piece decal.
 - 4. Colored rendition located at end of this section.
 - 5. Owner will provide computer images of the decal design and color.

2.09 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, specified, or required by code, 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.
 - 2. Corrosion Protection: Coat Concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- 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 with plastic shields or stainless steel expansion type anchors 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.

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Signs.
 - B. Posts.

1.02 REFERENCES

- A. ASTM A36 Structural Steel.
- B. MUTCD Manual of Uniform Traffic Control Devices.
- C. NYSDOT (New York State Department of Transportation) Standard Specifications.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate mounting and construction details.
- C. Certificates: Provide certificate from supplier indicating products meet or exceed specified requirements.

1.04 REGULATORY REQUIREMENTS

- A. All materials and installation are to be in accordance with the Federal MUTCD and Section 645 of the NYSDOT Standard Specifications.
- 1.05 DELIVERY, STORAGE AND HANDLING
 - A. Handle products in a manner which will not damage the reflective face of the sign or dent the sign in any way.

1.06 COORDINATION

A. Coordinate placement of post with the placement of adjacent restoration materials, ground cover or pavements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Signs: Aluminum alloy 6061-T6, 0.100 inch thick; galvanized.
- B. Posts: ASTM A36 galvanized steel U-channel; 2 lbs./linear foot.

2.02 ACCESSORIES

A. Hardware: 2-inch bolt with nut and lockwasher; Galvanized aluminum.

2.03 FABRICATION

- A. Fabricate posts with mounting holes as required to install sign.
- B. Fabricate all signs to the sizes and shapes as indicated by the NYSDOT MUTCD.

C. Holes in the sign may be drilled or punched; all cut edges must be smooth, true and free from burrs and ragged breaks.

2.04 FINISHES

- A. Signs: Flexible, weather resistant and reflectorized finish; of the colors indicated by the NYSDOT MUTCD.
- B. Posts: Green enamel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing site and conditions.
- B. Verify that signs will be visible from roadway in their proposed locations.

3.02 INSTALLATION

- A. Excavate as required to install post to the depth required.
- B. Place post such that the post is installed truly vertical.
- C. Signs shall be installed with the following alignment:
 - 1. Handicap Parking Signs: Face of sign parallel to the smaller parking space dimension.
 - 2. All Other Signs: Face of sign to be 87 degrees from the centerline of the roadway or travelway.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 2 degrees.
- B. Maximum Variation from True Alignment: 1 degree.

3.04 CLEANING

A. Clean all sign faces to provide proper reflectivity.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect signs and posts from damage until project is accepted by the Owner.

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 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: Overhead Braced (Bradley, Mills Partitions, Series 400)
- 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: One 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.

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 SUMMARY

A. This Section includes the following:1. Manually operated, paired panel operable partitions.

1.03 RELATED SECTIONS INCLUDE THE FOLLOWING:

- A. Division 03 Sections for concrete tolerances required.
- B. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
- C. Division 06 Sections for wood framing and supports, and all blocking at head and jambs as required.
- D. Division 09 Sections for wall and ceiling framing at head and jambs.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- D. The operable wall must be manufactured by a certified ISO 9001 company or an equivalent quality control system.

1.05 REFERENCE STANDARDS

- A. ASTM E413 Classification for Rating Sound Insulation; 2022.
- B. ASTM E557 Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- D. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- E. Health Product Declaration Collaborative: Open Standard v2.1
- F. ICC A117.1-2009 Accessible and Usable Buildings and Facilities; 2009.

- G. ISO 14021 Environmental Labels and Declarations Self-Declared Environmental Claims (Type II Environmental Labeling).
- H. ISO 14025 Environmental Labels and Declarations Type III Environmental Declarations Principles and Procedures; 2006.
- I. ISO 14040 Environmental Management Life Cycle Assessment Principles and Framework; 2006, with Amendment (2020).
- J. ISO 14044 Environmental Management Life Cycle Assessment Requirements and Guidelines; 2006, with Amendment (2020).
- K. ISO 21930 Sustainability in Buildings and Civil Engineering Works Core Rules for Environmental Product Declarations of Construction Products and Services; 2017.

1.06 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.
- E. Reports: Provide a complete and unedited written sound test report indicating glass thickness and spacing in test specimen matches product as submitted.
- F. Create spaces that are healthy for occupants.
 - 1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.
- G. Furnish materials that generate the least amount of pollution.
 - 1. Furnish products and materials that have third party verified environmental product declarations (EPD's). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.
- H. Buy American: Folding door to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs Service and Border Protections regulations and be labeled "Made in America".
- 1.07 DELIVERY, STORAGE, AND HANDLING
 - A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.

B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.08 WARRANTY

- A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- B. Partition Warranty period: Three (3) years.
- C. Suspension System Warranty: 1. OP-01: Five (5) years.

PART 2 – PRODUCTS

- 2.01 MANUFACTURERS, PRODUCTS, AND OPERATIONS
 - A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Modernfold, Inc. 215 West New Road Greenfield, IN 46140 Toll Free: 800.869.9685 email: info@modernfold.com www.modernfold.com
 - 2. Architect approved equivalent
 - B. Doors to be manufactured in the U.S.A.
 - C. Products: Subject to compliance with the requirements, provide the following product:
 1. Acousti-Seal Encore Paired Panel: Manually operated paired panel operable partition.

2.02 OPERATION

- A. Acousti-Seal Premier- Paired Panel: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals and automatic top seals.
- B. Final Closure:
 - 1. Horizontally expanding panel edge with removable crank.

2.03 PANEL CONSTRUCTION

- A. Nominal 3 inch thick panels in manufacturer's standard 48-inch widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
- B. Panel skin shall be:
 - 1. Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction minimum:
 - a. 50 STC
- C. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be:

- 1. Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
- D. Panel Trim: No vertical or horizontal trim required or allowed on edges of panels; minimal groove appearance at panel joints.
- E. Panel Weights:
 - 1. 8 lb/sq.ft..

2.04 PANEL FINISH

- A. Panel finish shall be factory applied, Class "A" rated material. Finish shall be:
 - 1. Reinforced vinyl with woven backing weighing not less than 21 ounces (595 grams) per lineal yard.
- B. Panel Trim: Exposed panel trim of one consistent color:
 - 1. As selected by the Architect from the manufacturer's full color offering.

2.05 SOUND SEALS

- A. Vertical Interlocking Sound Seals between panels: Aluminum astragals, with tongue and groove configuration in each panel edge. Rigid plastic astragals are not acceptable.
- B. Horizontal Top Seals shall be Modernfold SureSet[™] automatic operable top seals, manually operated top seals not required or permitted.
- C. Horizontal bottom floor seals shall be Modernfold Sureset[™] bottom seal:
 - Modernfold SM2 Bottom Seal. Manually activated seals providing nominal 2" (51mm) operating clearance with an operating range of + 0.50" (13mm) to -1.50" (38mm). Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds (54 kg) downward force to the floor throughout operating range.

2.06 SUSPENSION SYSTEM

- A. #17 Steel Track Suspension System
 - 1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
 - a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 - 2. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

2.07 ADDITIONAL FEATURES

- A. Single Pass Door
 - 1. Matching pass door same thickness and appearance as panels. ADA compliant pass door to be trimless and equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.
 - 2. Hardware:
 - a. Flush pull
 - b. Automatic door closer

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.02 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.03 ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.04 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representative.

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. Wall Mounted Soap Dispensers.
 - 2. Surface-Mounted Multi-Roll Toilet Tissue Dispensers.
 - 3. ADA Compliant Grab Bars.
 - 4. Surface Mounted Sanitary Napkin Disposals.
 - 5. Towel Bars.
 - 6. Robe Hooks.
 - 7. Shower Curtain Rods, Curtains and Hooks.
 - 8. Fold Down Shower Seat.
 - 9. Mop and Broom Holders.
 - 10. Tubular Steel Wall Racks (Coat Racks).
 - 11. Electric Hand Dryers.
 - 12. Diaper Changing Station.
 - 13. Mirrors.
 - 14. Associated Fasteners and Batteries.
- 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 solid wood blocking for this material.
 - 4. Section 093013 Ceramic Tiling for attachment to this material.
 - 5. Section 102113 Toilet Partitions for attachment to this material.
 - 6. Section 102826 Hygiene Accessories for hand sanitizers.

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.
- E. Maintenance: Provide manufacturer's written maintenance instructions and recommendations for each item where applicable.

F. Warranties: Provide manufacturer's standard warranty for each item or groups of items. Specific duration warranties are specified in the technical section below. All warranties shall commence on the date of Substantial Completion of 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.

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 COMPARTMENTS

- A. Items
 - 1. Surface-mounted multi-roll toilet tissue dispenser with shelf Bradley 5263.
 - 2. Surface mounted sanitary napkin disposal Bradley 4722-15
 - a. Locations where shown on Contract Drawings.
 - 3. Grab Bars Bradley 812 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.
 - 4. Semi-Recessed Waste Receptacle Bradley 346-10
 - a. Capacity: 12 Gallons
 - b. Finish: Satin Finish
 - 5. Free-standing waste receptacle Bradley 377-36

- a. Capacity: 21 gallons
- b. Location: Decon Bathroom 113
- Surfae Mounted Towel Dispenser with Sensor Activation Bradley 2496
 a. Type: Roll-type
- 7. Coat/Robe Hook Bradley 9B1-1102
 - a. Style: Double Hook
 - b. Finish: Satin Stainless
- 8. Mirror Bradley 7B1-0024360
 - a. Finish: Satin Stainless
 - b. Locations: where shown on Contract Drawings.
- 9. Mirror Bradley 781-24362
 - a. Location: Decon Bathroom 113
- 10. Surface-Mounted foam soap dispenser- Bradley 6A01
 - a. Location: Decon Bathroom 113

2.03 ADA SHOWER AREA

- A. Items:
 - 1. Shower Curtain Rods:
 - a. Rod size and material: 1-1/4 in. Bradley 9539.
 - b. Mounting: Concealed mounting with snap-on vandal resistant protective escutcheons.
 - c. Lengths: 36" & 60"
 - 2. Microban anti-bacterial shower curtain: Bradley 9537 shower width +6" wide, white
 - 3. Curtain Hooks: Bradley 9536.
 - 4. Grab Bars Bradley 812 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. Configuration: shown on drawings.
 - 5. Fold Down Shower Seat (Reversible): Bradley 9569 Configuration as shown on Contract Drawings.
 - 6. Surface Mount Shower Soap Dish: Bradley 9014.
 - a. Finish: Satin Stainless Steel.

2.04 CUSTODIAL AREAS

- A. Mop and Broom Holders (without shelf)
 - 1. Configuration: holders Bradley 9954 304 Stainless Steel.
 - 2. Length: 36 inches.
 - 3. One per Room

2.05 TUBULAR STEEL WALL RACKS (COAT RACKS)

- A. DS Series Wall Mounted Coat Racks as manufactured by Magnuson Group, 1400 Internationale Parkway, Woodbridge, IL 60517, <u>www.magnusongroup.com</u> or Architect approved equivalent.
 - 1. Model: DS-3H; Powder-coated steel rack with stainless steel 1" hanger bar.
 - 2. Finish: Bronze Metallic
 - 3. Colors: Medium Gray, Sandstone, Black, Lunar White or Bronze Metallic. Color to be selected by Architect.
 - 4. Provide wall racks in lengths as shown on Contract Drawings.

- B. Include five (5) hangers per foot of wall rack.
 - 1. Open hook #MG-17OHN wire steel hangers by Magnuson Group.

2.06 ELECTRIC HAND DRYERS

- A. Bradley 2923-287401
 - 1. Finish: Satin
 - 2. Voltage: 120-277V
 - 3. Motor: 950W

2.07 DIAPER CHANGING STATION

- A. Bradley Model 962 -- Recess Mounted Stainless Steel Baby Changing Station.
- B. Koala Kare Products, 6982 S. Quentin St., Centennial, CO 80112, Phone: 888-733-3456.
 1. Model Number: KB310-SSRE, Stainless Steel-Clad Recess mounted horizontal Baby Changing Station with polyethylene interior.

2.08 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.
- C. At Substantial Completion, install new batteries in all battery operated devices.

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. Install at elevations pursuant to applicable codes, manufacturers published instructions, and as may be modified on Drawings.
 - 1. Diaper Changing Station to be mounted with top of unit 46 ½" A.F.F.
 - 2. Wall mounted soap dispensers shall be mounted a minimum of 12" horizontally from electric hand dryers.
 - 3. Hand Sanitizer Dispenser to be mounted with bottom of unit 44" A.F.F.
- D. All installations must fasten into solid structure or blocking.
- E. Fit flanges, escutcheons, and edges tight against finish surface.
- F. Provide all accessories keyed alike. Turn over all keys and/or access tools to the Owner.
- G. Provide hand sanitizer bottles and batteries to the Owner. Do not install in units where they would get utilized by construction personnel.
- H. Remove and discard finish protective coverings.
- I. Provide batteries in all accessories requiring batteries.

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 solid wood blocking required for securement of cabinets.

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.
- D. Installation Instructions: Submit manufacturer's written installation instructions for each product specified and required in this specification.

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 TOUCHLESS HAND SANITIZER DISPENSER

- 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 products 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.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Automatic Emergency Defibrillator equipment package.

1.02 SUBMITTALS

A. Submit product data under provisions of Section 013300 - SUBMITTALS.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Physio-Control Manufacturing, 11811 Willows Road NE, Redmond, WA 98052; www.physio-control.com
- B. Or approved equal.

2.02 MATERIALS

- A. Physio-Control LIFEPAK CR Plus
 - 1. Manufacturer's 8- year Warranty
 - 2. Quantity: One (1) per location.
- B. LifeShield AED Compliance Management
 - 1. AED Registration
 - 2. Medical Direction and AED oversight literature.
- C. Alarmed AED wall Cabinet with keyed lock and signage.
- D. LIFEPAK CR Plus Carrying Case.
- E. LIFEPAK CR Plus Charge Pak
 - 1. Battery unit.
 - 2. Two (2) sets of adult electrodes
- F. LIFEPAK CR Pediatric Pads.
- G. Rescue Ready Kit
 - 1. Pair of Large Nitrile Gloves.
 - 2. CPR Pocket Mask with O2 inlet.
 - 3. One pair of Shears
 - 4. One Chest Hair Razor.
 - 5. One Package Hand Sanitizing Alcohol Wipes.
- H. Physicians Prescription (Required by FDA)
- I. AED Wall Sign.
- J. AED Window Decal.
- K. AED Check Tags with strings.1. Provide Two-year supply of tags.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install one set of complete equipment as indicated in 2.02 A-K at location(s) indicated on the drawings or as directed by the Architect/Engineer.
- B. Installation shall follow manufacturer's instructions and conform to ADA and FDA requirements upon completion.
- C. Turn over keys for the cabinet lock to the Owner at Substantial Completion.

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 related 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 E814-13a "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.
- F. Warranty: Provide manufacturer's standard one (1) year warranty against defects in materials and workmanship.

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. 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. American AED, 3151 Executive Way, Miramar, FL 33025. Phone: (800) 884-6480.
- C. Master Medical Equipment, 2345 Dr. F. E. Wright Drive, Jackson, Tn 38305, Phone: (866) 530-9032.
- D. Architect Approved Equivalent.

2.02 AED CABINETS

- A. Cabinet with steel trim and door: 1400 Lifestart[™] Series, Model 1417F12.
 - 1. Cabinet Style: Semi-recessed.
 - 2. Components:

C.

- 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
 - Trim Style and Depth:
 - 1) Semi-Recessed Cabinet:
 - (a) Rolled Edge: 3 inch (76.20 mm).
- 3. Fire-Rating: Provide one hour rated cabinets in rated wall systems.
- 4. Alarms: Standard: 85 db Commander (audible) cabinet-mounted alarm standard (battery operated) to protect against theft or tampering. Alarm deactivated when door is closed. Provide 9-volt battery to operate alarm.
- 5. Wall Signs and Cabinet Lettering:
 - a. AED wall signs: HSAED-SIGN (Tent Wall Sign)
 - 1) Provide one sign above each cabinet.
 - b. Cabinet Lettering: Red "AED" lettering and "heart symbol".

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.
- F. Install battery just prior to Substantial Completion and test unit for proper alarm operation.

PART 1- GENERAL

1.01 RELATED DOCUMENTS

A. Drawing 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. Emergency Self-Contained Eyewash Station.
- B. Related Sections include the following:
 1. Section 042200 Concrete Unit Masonry for attachment to this material.

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 016100 Product Requirements.
- C. Product Data: Indicate manufacturer's name, product model number, mounting, special components, and location of each item.
- D. Installation Instructions: Submit manufacturer's written installation instructions.
- E. Submit Manufacturer's written operating and maintenance instructions including ordering information for replacement supplies.

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 cleaning.

PART 2 – PRODUCTS

2.01 EYEWASH STATION

- A. Honeywell Fendall 2000[™] series Sterile Eyewash Station Model #32-002000-0000 with sterile saline cartridge manufactured by Sperian Eye & Face Protection.
 - 1. Provide with four (4) (three (3) extra) eyewash station sterile saline refill cartridges #32-ST2050-0000.
 - 2. Provide with one Fendall 2000 Dust Cover #32-002015-0000 and emergency eyewash station sign.
 - 3. Provide installation/training DVD to Owner as part of closeout documents.
- 2.02 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. Install at elevations pursuant to applicable codes, manufacturer's published instructions, and as may be modified on Drawings.
- D. Do not install eyewash station until just before Substantial Completion and all final cleaning has been performed. Install emergency eyewash station sign directly above unit with bottom of sign at 8'-0" A.F.F.
- E. Turn over spare saline refill cartridges to Owner.
- F. Remove and discard finish protective coverings.

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
 - 3. Fire Extinguisher Signage
 - 4. Exterior Knox Box

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. NFPA 10 "Standard for Portable Fire Extinguishers".
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.
 - 2. UL 299 Dry Chemical Fire Extinguisher.

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 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. Do not test operate extinguishers.

1.07 WARRANTY

- A. Fire Extinguisher Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

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 LLC
 - 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 door frames.
 - 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.
 - Exposed Trim: One-piece combination trim and perimeter door frame 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.
 - 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 Contract Drawings and any other locations required by Codes.
 - 2. Provide rigid 60-mil plastic 3-Way View Fire Extinguisher sign with arrow and graphic Style No. 2095C UltraGlo[™] by Seton, PO Box 458, Buffalo, NY 14240, Phone: 877-583-1845 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 C260 or equal.
 - 1. Supply wall mounting bracket.

2.04 KNOX BOX

- A. KNOX-BOX as manufactured by KNOX Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027, Phone: 800-552-5669.
 - 1. Model: 3200 Series Commercial with recessed mounting kit (RMK).
 - 2. Color as selected by the Architect from manufacturer's standard colors.
 - 3. Coordinate with Owner for required information to place order.

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 Contract 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 42" above finished floor.
 - 2. Bottom shall not be less than 15" above finished floor.
- C. Install KNOX Box in accordance with manufacturer's instruction and fire department requirements. Install at location shown on Contract Drawings or if not shown, adjacent to main entrance at 40" AFF to bottom of box. Adjust mounting height if necessary to fall in masonry coursing.

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.

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. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 2. Fire Company Key Box.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.05 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths and required blocking provisions.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.02 FIRE-PROTECTION CABINETS

- A. Cabinet Type: Suitable for fire extinguishers.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Activar Construction Products Group, Inc. JL Industries, Inc. (Basis of Design)
 - b. Larsen's Manufacturing Company.
 - c. Potter Roemer LLC.
- B. Cabinet Construction: Nonrated

- C. Cabinet Series: ACADEMY SERIES ALUMINUM
- D. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 1. Trim Type: Rolled Edge with 2 1/2 inch backbend.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Aluminum (ASTM B221).1. Color and Finish: Clear Anodized.
- G. Tub Material: Cold rolled steel (standard) with Black powder-coat finish
- H. Door Style: Vertical Duo panel with pull handle.
- I. Door Glazing: Clear Tempered Glass.
 - 1. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear obscure).
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide recessed door pull and friction latch as per manufacturer's standards and as selected or indicated on the drawings.
 - 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- K. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as specified.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

2.03 FIRE PROTECTION CABINETS (OVAL TYPE EXTINGUISHERS)

- A. Recessed Low Profile Tub Cabinet for Oval Fire Extinguishers: Orbit Series cabinets to fit into a 3 5/8 inch stud wall and meet ADA 4 inch maximum requirement for protruding objects. Manufacturer: Activar Construction Products Group, Inc. - JL Industries or approved equal.
 - 1. Flush door with 5/8 inch door stop.
 - 2. 3/8 inch flat trim with 1 3/4 inch face on frame and 1 1/4 inch trim on door.
 - 3. Continuous hinge.
 - 4. Zinc plated handle and roller catch.
 - 5. Clear Acrylic Glazing.
 - 6. Finish: Powder-coated Steel

2.04 FIRE COMPANY KEY ACCESS UNIT

- A. KNOX-BOX 3200 Series: Recessed Mount Model 3275 with recess mounting kit (RMK) with hinged door as manufactured by KNOX Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027. Phone: 1.800.552.5669.
 - 1. Holds up to 10 keys. Access Cards may also be placed inside unit with a corresponding loss of key storage capacity.
 - 2. Gasketed Door for weather resistance Knox Rainguard.
 - 3. UL Listed: UL 1037, UL 1610 and UL 1332.
 - 4. Options included: Recessed Mounting Kit (RMK)
 - 5. National Fire Code compliant.
 - 6. Unit Size: Recess Mounted Unit Flange: 7 inches wide by 7 inches high by 3 inch recess (3 7/8 inches overall depth)
 - 7. Knox-Coat Color: As selected by the Architect form the manufacturer's full color offering.
 - 8. Location: As indicated by Fire Marshal.

2.05 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Install door hardware at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.06 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinets: 48 inches above finished floor to top of fire extinguisher handle (ADA).
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
 - 2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
- C. Identification: Apply vinyl lettering at locations indicated.
- D. Wall Signs:
 - 1. Location: Where shown or directed.
 - 2. Apply on walls after field painting is completed and has been accepted.
- E. Fire Department Key Access Unit: Install Knox Box in accordance with the manufacturer's instructions and in compliance with the Fire Department / Fire Marshal requirements.

3.04 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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. Fire-rated fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 2. Fire Company Key Box.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.05 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths and required blocking provisions.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.
- B. ADA compliant with less than 4 inch projection into corridors.

2.02 FIRE-PROTECTION CABINETS

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. JL Industries, Inc.; Embassy Fire-FX2, Model 5614VFX (Basis of Design).
 - b. Larsen's Manufacturing Company.
 - c. Potter Roemer LLC.
- B. Cabinet Construction: ASTM E814, Fire rated for one or two hours with fire-resistant liner. Rating as required by wall type.

- C. Cabinet shall have reinforced corner trims and factory -supplied anchoring devices as required for the fire rating.
- D. Cabinet Series: EMBASSY SERIES TRIMLESS DECORATIVE
- E. Tub Material: Cold rolled steel (standard) with Black powder-coat finish. Provide 5/8" minimum fire resistant barrier material between double wall constructions.
- F. Recessed Frameless Cabinet Door: Flush, one-piece combination trim and perimeter door frame with 7/8" thick return to wall surface.
- G. Door Material: Powder-coat paint steel sheet with white finish. Powder-coat paint steel sheet with white finish.
- H. Door Style: V: Vertical Duo; concealed pull
- I. Door Glazing: Type 17: Clear tempered glass.
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide concealed door pull and friction latch as per manufacturer's standards and as selected or indicated on the drawings.
 - 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- K. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

2.03 FIRE COMPANY KEY ACCESS UNIT

- A. KNOX-BOX 3200 Series: Recessed Mount Model 3275 with recess mounting kit (RMK) with hinged door (Knox eLock Core and trackable with the cloud-based KnoxConnect Management System as required by Fire Department). Unit shall be as manufactured by KNOX Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027. Phone: 1.800.552.5669.
 - 1. Holds up to 10 keys. Access Cards may also be placed inside unit with a corresponding loss of key storage capacity.
 - 2. Gasketed Door for weather resistance Knox Rainguard.
 - 3. UL Listed: UL 1037, UL 1610 and UL 1332.
 - 4. Options included: Recessed Mounting Kit (RMK). Install unit with mounting hardware provided in accordance with manufacturer's instructions to provide a secure installation.
 - 5. National Fire Code compliant.
 - 6. Unit Size: Recess Mounted Unit Flange: 7 inches wide by 7 inches high by 3 inch recess (3 7/8 inches overall depth)
 - 7. Knox-Coat Color: As selected by the Architect form the manufacturer's full color offering.

- 8. Location: As indicated by Fire Marshal.
- B. Architect Approved Equivalent.

2.04 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, liner and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Install door hardware at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.05 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Verify construction of fire rated walls and that Fire Rated extinguisher cabinets are UL labeled as required by wall rating and that the cabinet has been tested to meet ASTM E814.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Install Fire Extinguisher cabinets in strict accordance with the manufacturer's requirements in order to obtain the required fire rating.

3.02 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinets: Install as indicated on the drawings to achieve 48 inches above finished floor to top of fire extinguisher handle (ADA) maximum.
 - 2. Securely fasten mounting brackets and fire extinguisher 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. Identification: Apply vinyl lettering at locations indicated.
- C. Wall Signs:
 - 1. Location: Where shown or directed.
 - 2. Apply on walls after field painting is completed and has been accepted.
- D. Fire Department Key Access Unit: Install Knox Box in accordance with the manufacturer's instructions and in compliance with the Fire Department / Fire Marshal requirements.

3.04 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Ensure that each extinguisher is fully charged, and that inspection of each extinguisher has been performed, as evidenced by the National Association of Fire Equipment Distributors certification tag, just prior to turnover.
- F. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Phenolic lockers.
- 1.02 RELATED REQUIREMENTS
 - A. Section 061000 Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

1.04 SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, hardware, fastenings, finishes, sizes and accessories.
- C. Shop Drawings: Indicate numbering plan, room sizes, locker layout, locker dimensions, material thickness, trim, hardware, finishes, base, doors, accessories, and installation details.
- D. Samples: Submit two samples 3 by 3 inches (75 by 75 mm) in size, of each color scheduled.
- E. Closeout Documents:
 - 1. Operation and Maintenance data
 - 2. Warranty

1.05 QUALITY ASSURANCE

- A. Fabricator shall have 10 years or more experience in fabrication of solid phenolic materials and shall be experienced in performing work of similar size and scope.
- B. Fabricator shall be capable of providing field service representation.
- C. Installer shall be approved by the manufacturer and be experienced in performing work of similar size and scope.

1.06 COORDINATION AND PROJECT CONDITIONS

- A. Field Measurements: Before material fabrication, verify actual field measurements and show actual measurements on shop drawings
- B. Coordination: Coordinate field measurements with fabrication schedule construction progress to avoid construction delays.
- 1.07 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver materials in the manufacturer's original protective packaging.

- B. Store materials in an enclosed shelter providing protection from damage, temperature, humidity, and exposure to the elements.
- C. Protect locker finish and adjacent surfaces from damage.

1.08 WARRANTY

A. Submit executed copy of the manufacturer's 10-year warranty against defects in material and 2 years warranty for system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Phenolic Lockers:
 - 1. Bradley Corporation: Phenolic Lockers
 - 2. Spectrum Lockers solid phenolic composite material.
 - 3. ASI Storage Solutions: Phenolic Traditional Plus Collection.
 - 4. Architect approved equivalent.

2.02 LOCKER APPLICATIONS

- A. Fitness Room Lockers: Four tier lockers, free-standing with matching closed base.
 - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 2. Overall Width: 18 inches (457 mm).
 - 3. Overall Depth: 18 inches (457 mm).
 - 4. Overall Height: 71 3/4 inches (1830 mm) + base.
 - 5. Locker Configuration: Four tier.
 - 6. Fittings: Size and configuration as indicated on drawings.
 - 7. Locker Door Style: Standard, no venting.
 - 8. Locking: Padlock hasps, for padlocks provided by Owner.
 - 9. Coat Rod: None no coat rod.
 - 10. Base: Standard Base.
 - 11. Provide Flat (1/2 inch thick) top.

2.03 PHENOLIC LOCKERS

- A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
 - 1. Doors: Full overlay, covering full width and height of locker body; square edges.
 - 2. Door Corners: Radius edge.
 - 3. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
 - 4. Material Fire Resistance (ASTM E84): Class A
 - 5. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
 - 6. Provide filler strips where indicated, securely attached to lockers.
 - 7. Door Color: As selected by Architect/Engineer from manufacturer's full color range.
 - 8. Core Color: Black
 - 9. Body Color: Manufacturer's standard white or light color.
 - 10. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
 - 11. Door Fastenings: Through Bolted.

- B. Component Thicknesses:
 - 1. Doors: 1/2 inch (13 mm) minimum thickness.
 - 2. Locker Body: One of the following combinations:
 - a. Tops, bottoms, and shelves 1/2 inch (13 mm); sides 1/2 inch; backs 1/2 inch; minimum.
 - 3. End Panels and Filler Panels: 1/2 inch (13 mm) minimum thickness.
 - 4. Sloped Tops: 1/2 inch (13 mm) minimum thickness.
 - 5. Toe Kick Plates: As indicated on the drawings, 1/2 inch (13 mm) minimum thickness.
- C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
 - 1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.
- D. Hinges: 304-grade Stainless steel, satin finish; minimum of 90 degree opening; either exposed barrel 5-knuckle hinge attached to back of door and inside of body with Type 304 stainless steel tamperproof screws, or completely concealed cabinetwork style hinge attached with tamperproof screws.
 - 1. Provide Two (2) hinges for multi-tier unit doors.
- E. Locks: Locker manufacturer's standard type indicated above.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb, level, rigid and square.
- C. Bolt adjoining locker units together to provide rigid installation.
- D. Install end panels, filler panels, sloped tops, miscellaneous panels, and trims.
- E. Install accessories and number plates as indicated on the shop drawings.
- F. Replace components that do not operate smoothly.
- G. Correct and/or replace damaged components as directed by architect.

3.03 ADJUSTMENT

- A. Adjust doors and locks for smooth operation without binding.
- B. Lubricate door hinges and locks per manufacturer's instructions.

3.04 PROTECTION

A. Protect locker finish and adjacent surfaces from damage.

3.05 CLEANING

A. Clean locker interiors and exterior surfaces in accordance with the manufacturer's instructions.

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 ground-mounted flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
 - 1. Seismic Loads: according to SEI/ASCE 7 for the location of the project.
 - 2. Wind Loads: 130 mph and exposure B according to SEI/ASCE 7.
 - 3. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 1. Include section, and details of foundation system for ground-mounted flagpoles.
- C. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.07 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

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. American Flagpole; a Kearney-National Inc. Company Coastal Series, Model CIWW-40-D12
 - 2. Millerbernd Manufacturing Company.
 - 3. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
 - 4. Pole-Tech Company Inc.

2.02 FLAGPOLES

- A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 - 3. Provide self-aligning, snug-fitting joints.
- B. Exposed Height: 30 feet or as indicated on the drawings.
- C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063-T6, with a minimum wall thickness of 3/16 inch (0.188 inch).
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch (1.6-mm) nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch (19-mm) diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
 - 1. Provide flashing collar of same material and finish as flagpole.
- E. Sleeve for Aluminum Flagpole: foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - 1. Provide ground spike at grade-mounted flagpoles.

2.03 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 - 1. 0.063-inch (1.6-mm) Heavy-Duty spun aluminum, finished to match flagpole.
- B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
 - Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Provide two flag clips per halyard.
 - a. Product: Subject to compliance with requirements, provide "Quiet Halyard" flag clasp by Lingo.

2.04 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C33/C33M, fine aggregate.
- D. Elastomeric Joint Sealant: Single-component nonsag urethane joint sealant complying with requirements in Section 1000369 1000369 for Use NT (non-traffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.05 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. 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.

2.06 ALUMINUM FINISHES

- A. Finish as selected by the Architect from one of the following:
 - 1. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
 - 2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
 - Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 a. Color: As selected by Architect from full range of industry colors and color densities.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Place concrete, as specified in Section 1000116 1000116. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.
- E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.03 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.
- B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.
 - 1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.
- D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.
- E. Lower and set finishing collar in accordance with the manufacturer's instructions.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric vehicle charging systems.

1.02 REFERENCE STANDARDS

- A. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- B. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. National Electrical Code (NEC) Article 625 Electric Vehicle Charging System.
- D. SAE J1772 Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler.
- E. UL 2231-1 Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements.
- F. UL 2231-2 Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems.
- G. UL 2594 Electric Vehicle Supply Equipment.

1.03 PREINSTALLATION MEETINGS

- A. Convene preinstallation meeting before start of installation of electric vehicle charging systems.
- B. Require attendance of parties directly affecting work of this section, including Contractor, Architect, installer, and manufacturer's representative.
- C. Review materials, installation, adjusting, cleaning, demonstration, instruction and training, protection, maintenance, and coordination with other work.

1.04 SUBMITTALS

- A. Comply with Section 013300 SUBMITTALS.
- B. Product Data:
 - 1. Submit manufacturer's product data, including installation instructions.
 - 2. Submit manufacturer's project proposal describing electric vehicle charging subsystems:
 - a. Charging station.
 - b. Mounting device options.
 - c. Web-based software and network services.
- C. Shop Drawings: Submit project shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, fabrication, fasteners, hardware, finish, electrical wiring diagrams, options, and accessories as required by Owner.
- D. Manufacturer's Project References: Submit manufacturer's list of successfully completed electric vehicle charging system projects, including project name and location, name of architect, and type and quantity of electric vehicle charging systems furnished.
- E. Operation and Maintenance Data: Provide detailed information required for Owner to properly operate and maintain equipment.

F. Warranty Documentation: Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer regularly engaged, for a minimum of 3 years, in the manufacturing of electric vehicle charging systems of similar type to that specified.
- B. Installer's Qualifications:
 - 1. Installer regularly engaged, for a minimum of 5 years, in installation of low-voltage distribution equipment.
 - 2. Employ persons trained for installation of low-voltage distribution equipment.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
 - B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials and finish during storage, handling, and installation to prevent damage.

1.07 WARRANTY

A. Warranty Period: 3 Years.

PART 2 PRODUCTS

2.01 ELECTRIC VEHICLE CHARGING SYSTEMS

- A. Electric Vehicle Charging Systems:
 - 1. Electric vehicle charging stations.
 - 2. Software and network services.
 - 3. Electric vehicle driver access.
 - 4. Maintenance and service.
 - 5. Installation and training.

2.02 ELECTRIC VEHICLE CHARGING STATIONS

- A. Electric Vehicle Charging Stations: "ChargePro 620".
 - 1. Mounting: Dual-head pedestal mount.
 - 2. Head Unit:
 - a. Factory-assembled, 1-piece, sealed enclosure.
 - b. No field assembly required.
 - c. Dimensions: 20 inches high by 6 inches wide by 6 inches deep.
 - d. Enclosure Primary Material: Aluminum.
 - 3. Access Panel: For installation and maintenance.
 - 4. LED Lights: Indication of electric vehicle charging station status.
 - a. Steady Blue: Station available.
 - b. Flashing Green: Vehicle charging.
 - c. Steady Green: Vehicle fully charged.
 - d. Steady Red: Ground-fault detection.

- 5. LCD Messaging Screen:
 - a. Communicates charging instructions to electric vehicle drivers.
 - b. Backlit.
- 6. Standard Cable Management: Looped cable on rack.
 - a. When charging session is complete, electric vehicle driver returns plug to head unit and manually loops cable on stainless steel cable rack.
- 7. Optional Cable Management System: Retractable cable lanyard.
 - a. When charging session is complete, electric vehicle driver returns plug to head unit and cable automatically retracts to organized loop.
 - b. Lanyard: Mechanical pulley system to support cable and keep it above parking lot surface at all times.
 - c. Lanyard Housing Primary Material: Aluminum.
- 8. Smart Card Authentication:
 - a. For open or restricted access control.
 - b. Manufacturer's "SemaCharge Passes" available for electric vehicle drivers.
 - c. For billing and payment for electric vehicle drivers.
- 9. Plug: Able to charge all new electric and plug-in hybrid electric vehicles.
- 10. Electricity Metering: Energy monitoring.
- B. Power:
 - 1. AC Power Output, Maximum: Level 2. 7.2 kW (240 VAC at 30 A).
 - 2. AC Power Input: Level 2. 30 A; Line 1, Line 2, and Earth (no neutral).
 - 3. Vehicle-to-Charger Connection: SAE J1772 EV Connector, 18-foot cable.
 - 4. Energy Metering Accuracy: 1 percent at 5-minute interval (standard).
 - 5. Standby Power: 5 W typical.
 - 6. Service Panel Breaker: Dual-pole, 40-A, common-trip breaker, dedicated circuit.
- C. Safety:
 - 1. Safety, Ground-Fault-Circuit Interrupt: 5 mA CCID with auto retry (15-minute delay, 3 tries).
 - 2. Automatic Plug-Out Detection: Power terminated, SAE J1772. SMS or email notification.
 - 3. General Safety Compliance: UL Certified; CCID, UL 2231-1 and UL 2231-2; Meets UL 2594; NEC Article 625 Compliant.
- D. Network:
 - 1. Wide Area Network: Commercial CDMA or GPRS cellular network.
 - 2. Network Communication Protocol: TCP/IP.
 - 3. Network Security: HTTPS; 128-bit AES Encryption.
 - 4. Smart Card Reader: ISO 15693.
- E. Communications Device:
 - 1. LED Array: 270-degree visibility, multi-color visual status indication.
 - 2. LCD Screen: 2 lines, 16 characters per line.
- F. Site Conditions:
 - 1. Outdoor Rated:
 - a. NEMA 250: NEMA 3R.
 - b. IEC 60529: IP44.
 - 2. Operating Relative Humidity: Maximum 95 percent, non-condensing.
 - 3. Operating Temperature Range, Ambient: Minus 22 degrees F to 122 degrees F (minus 30 degrees C to 50 degrees C).
- G. Surge Protection: 6 kV at 3,000 A.
- H. EMI Compliance: FCC Part 15 Class A.

2.03 SOFTWARE AND NETWORK SERVICES

A. Station Management Software:

- 1. Provide Owner with web-based SemaConnect station management software.
- 2. Capable of configuring stations for pricing and access policies.
 - a. Pricing Policies Include: Time-of-use, duration-based, and kWh pricing.
 - b. Access Policies Include: Private-only, public-only, or combined private/public access.
- 3. Capable of generating operational reports, including:
 - a. Transaction Reports: Summary of individual session details (e.g. plug-in time, plug-out time, kWh delivered).
 - b. Usage Reports: Histogram summary of station usage by time-of-day in one-hour intervals.
 - c. Cost Reports: Summary of electricity cost generated by station usage.
 - d. Revenue Reports: Summary of Owner revenue generated from driver fees.
 - e. Sustainability Reports: Summary of carbon offset and fossil fuel consumption reduced due to usage of charging stations.
- B. Driver Account Software:
 - 1. Provide electric vehicle drivers with web-based SemaConnect driver account management software.
 - 2. Drivers register with address contact and credit card payment information.
 - 3. Drivers can specify SMS txt and email alert preferences (e.g. charge complete and plug-out).
 - 4. Drivers can monitor charging session history, including fees incurred and kWh consumed.
- C. Network Services:
 - 1. Monitor state-of-health of charging station 24/7.
 - 2. Automated driver billing and Owner payment.
 - 3. Pricing and access policy configuration through web-based software.
 - 4. Near real-time monitoring and reporting of charging session data.
 - 5. Near real-time mapping of station location, availability, access, and pricing information.
 - 6. Multiple portals for key stakeholders, including Owner, electric vehicle drivers, and customer service.

2.04 DRIVER ACCESS

- A. Account-Based Access Methods for Repeat Users:
 - 1. SemaConnect Smart Card: Drivers can access and pay for sessions.
 - 2. SemaConnect Smart Phone App: Drivers can locate, check real-time availability, start and pay for sessions.
 - 3. PlugShare Smart Phone App: Drivers can locate, check real-time availability, start and pay for sessions.
- B. Non-Account-Based Access Methods for First-Time Users:
 - 1. SemaConnect 1-800 Number: Drivers can start and pay for sessions using 1-800-663-5633.
 - 2. SemaConnect Mobile Web Site: Drivers can start and pay for sessions via Smart Phone via semacharge.com home page.
 - 3. PlugShare Smart Phone App: Drivers can locate, check real-time availability, start and pay for sessions.

2.05 ACCESSORIES

A. Anchors Plates:

- 1. For pedestal-mount installations.
- 2. Steel.
- 3. Top Plate: 3/8 inch by 8 inches by 8 inches.
- 4. Tube: 18 inches by 2.5-inch diameter.
- 5. Stabilizing Rods: 8 inches long.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive electric vehicle charging stations.
- B. Verify surfaces to support electric vehicle charging stations are clean, dry, flat, plumb, level, square, stable, rigid, and capable of supporting the weight.
- C. Notify Architect of conditions that would adversely affect installation or subsequent use.
- D. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Install electric vehicle charging stations in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install electric vehicle charging stations in accordance with NFPA 70.
- C. Pedestal Mount:
 - 1. Install concrete pad to dimensions indicated on the Drawings.
 - 2. Imbed anchor plate into concrete pad plumb, level, and square.
 - 3. Place concrete for pad as specified in Section 1000116 1000116.
 - 4. Bolt pedestal to anchor plate.
 - a. Adjust for plumb, level, and square with 4 set screws included in base.
 - 5. Attach head unit to pedestal.
- D. Wall Mount:
 - 1. Attach wall-mount bracket to wall in accordance with manufacturer's instructions plumb, level, and square.
 - 2. Attach head unit to wall-mount bracket.
- E. Pole Mount:
 - 1. Attach pole-mount bracket to pole in accordance with manufacturer's instructions plumb, level, and square.
 - 2. Attach head unit to pole-mount bracket.
- F. Electrical: Install circuit breaker, run electrical conduit, and connect electrical supply wires as specified in Division 26.
- G. Install electric vehicle charging stations weathertight.
- H. Install top of electric vehicle charging stations 56 inches above grade.
- I. Cable Management: Install standard cable management in accordance with manufacturer's instructions plumb, level, and square.
- J. Manufacturer:

- 1. Provide advisory assistance and guidance to installer for electrical preparation work and installation of electric vehicle charging stations.
- 2. Perform testing and monitoring of electric vehicle charging stations for full operational performance.

3.03 CLEANING

- A. Clean electric vehicle charging stations promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.04 DEMONSTRATION

- A. Demonstrate for Owner's personnel that electric vehicle charging systems function properly in every respect.
- 3.05 INSTRUCTION AND TRAINING
 - A. Provide instruction and training of Owner's personnel in the operation and maintenance of electric vehicle charging systems.
 - B. Include Instruction and Training for:
 - 1. Electric vehicle charging stations.
 - 2. Station management software.
 - 3. Electric vehicle driver software.
 - 4. Establishing access and pricing policies for Owner's electric vehicle charging station program.
 - C. Provide instruction and training by factory-trained and certified representative of manufacturer.

3.06 PROTECTION

A. Protect installed electric vehicle charging stations to ensure that, except for normal weathering, stations will be without damage or deterioration at time of Substantial Completion.

3.07 MAINTENANCE

- A. Provide operational service by manufacturer to minimize system downtime and to minimize maintenance costs incurred by Owner.
 - 1. Service shall include full replacement of universal charging station head unit.
 - 2. Manufacturer shall ship replacement unit to Owner.
 - 3. Failed unit shall be returned to manufacturer in same box as used to ship replacement unit.
 - 4. Owner's electric vehicle charging system shall be immediately operational with installation of replacement unit.
- B. Include in Network Service Fee:
 - 1. Real-time monitoring of operational performance of electric vehicle charging stations.
 - 2. Automatic upgrade to latest version of system software packages, including electric vehicle charging stations, station management software, and driver account software.
 - 3. Access to manufacturer's 24/7 customer support.
 - 4. System machine-to-machine communication fees.
 - 5. Integration into manufacturer's network operation center.

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. Electrically operated, front-projection screens and controls.
 - 2. Front projection screen controls

1.03 RELATED REQUIREMENTS:

- A. Section 092900 Gypsum Board: Ceiling for recessed screen installation.
- B. Division 26 Electrical for Screen motor operation.

1.04 DEFINITIONS

- A. Gain: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.05 ACTION SUBMITTALS

- A. Submit under the 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. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Wiring diagram for electrically operated units.
- D. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
 - 1. Drop lengths.
 - 2. Location of screen centerline relative to ends of screen case.
 - 3. Anchorage details, including connection to supporting structure for suspended units.
 - 4. Details of juncture of exposed surfaces with adjacent finishes.
 - 5. Location of wiring connections for electrically operated units.
 - 6. Wiring diagrams for electrically operated units.
 - 7. Accessories.
- E. Samples for Initial Selection: For each finish product, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For front-projection screens to include in maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of projection screen required from a single manufacturer as a complete unit, including necessary mounting hardware and accessories.
- B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install front-projection screens 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.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Protect screens from damage during delivery, handling, storage, and installation.

1.09 COORDINATION

- A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.
- PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Draper®, Inc., which is located at: 411 S. Pearl P. O. Box 425; Spiceland, IN 47385-0425. ASD. Toll Free Tel: 800-238-7999; Tel: 765-987-7999; Fax: 866-637-5611; Web: www.draperinc.com. Obtain accessories, including necessary mounting hardware, from screen manufacturer.
- B. Requests for substitutions will be considered in accordance with provisions of Section 012500 Product Substitution Procedures.

2.02 MOTORIZED, CEILING RECESSED, FRONT PROJECTION SCREENS

A. Access V: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 7-3/8" inches high x 8--1/16 inches deep (188 mm high x 205 mm deep). including trim flanges with white paint finish and stamped 13-gauge steel end ccaps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. Access case may be ordered in advance and the screen installed later to eliminate field damage. Screen installs in minutes. Housing is symmetrical allowing for left (standard) and right (optional) hand motor locations and for viewing surface to unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside top of case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.

- 1. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates 44db and is UL certified, rate 110-120V AC, 60 Hz, three wire, instantly reversible, life lubricated with pre-set accessible limit switches.
- 2. Motor shall be left mounted.
- B. Projection Viewing Surface:
 - 1. Matt White XT1000E On Axis gain of 1.0. 180 degree viewing cone. Washable surface. GREENGUARD Gold certified. 4K ready.
 - Contrast White XH1100E On Axis gain of 1.1. Diffuse white coating over a grey base material. Recommended for use with low to moderate light output digital projectors, where some provision for light control exists. Maximum size 8 feet by 10 feet (244 cm x 305 cm). 4K ready.
 - 3. Viewing Area (H x W)
 - a. HDTV Format (16:9). Black masking borders standard.
 - 1) 100 inches (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm).

2.03 FRONT PROJECTION SCREEN CONTROLS

- A. General: All controls are UL Certified.
 - 1. Multiple station control rated 115V AC, 60 Hz with 3-position rocker switches with cover plates to stop or reverse screen at any point. Automatic override allows only one signal to reach the motor when operated simultaneously.
 - 2. Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
 - 3. Low voltage 24V control unit with hand held RF remote three button control switch to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
 - 4. Motor shall be Left mounted.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify rough-in openings are properly prepared.
- C. 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 front-projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a

smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

- 1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
- C. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

3.04 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.

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 Specialized Equipment unique to the Fire Service.

1.03 RELATED REQUIREMENTS:

- A. Section 055500 Metal Fabrications: Rope Tie Offs, Bunting Hooks, Hose hanging brackets, Face shield hooks and Metal training aids & accessories.
- B. Section 105113.13 Gear Lockers.
- C. Section 149123.13 Fire Pole.
- D. Division 22 Plumbing
- E. Division 26 Electrical

1.04 STANDARDS

A. All work of this section shall confirm to industry standards and/or manufacturer's recommendations.

1.05 SUBMITTALS

- A. Pursuant to Section 013300 Submittals.
- B. Pursuant to Section 016000 Product Requirements.
- C. Product Data: Manufacturer's Data Sheets on each product specified herein.

1.06 QUALITY ASSURANCE

A. Experienced workers familiar with the work and according to manufacturer's recommendations and/or industry standards shall perform all work on this Section.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Pursuant to manufacturers published instructions.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS
 - A. Hose & Cylinder Storage, Hose Drying Racks, Hose Winding Equipment, Equipment & Bag Storage, Work Station/Work Benches, Vehicle Detail Centers, and Broom/Wash Center:
 - 1. GearGrid, LLC, 670 SW 15th Street, Forest Lake, MN 55025, Phone: (888) 643-6694.

- B. Turn Out Gear Dryers "Skelton Style":
 - 1. C & H Dehydrators, Inc., 398 Eastport Manor Rd., Manorville, NY 11949; Phone: (631) 801-2488.
 - 2. RAM AIR Gear Dryer, 1502 Patricia Avenue, Brandon, Manitoba R7A 7K7 Canada, Phone: (888) 393-3379.
 - 3. Williams Direct Dryers, #206 17665 66A Avenue, Surrey, BC V3A 4N4 Canada, Phone: (866) 534-4696.
- C. Turn Out Gear Dryers "Cabinet Style"
 - 1. Circul-Air Corp., 1932 Raymond Drive, Northbrook, IL 60062; Phone: (800) 795-1150.
- D. Tool Storage Chest:
 - 1. Stanley Black & Decker, Inc.-Craftsman
 - 2. Waterloo Industries, 1500 Waterloo Drive, Sedalia, MO 65301, Phone: (800) 833-8851.
- E. Footwear Sanitizing Systems
 - 1. Best Sanitizers Inc., PO Box 1360, Penn Valley, CA 95946. Phone: 888-225-3267 (Basis of Specification and Design).
 - 2. Horizon Equipment Company, 495 Alt 19, Palm Harbor, FL 34682. Phone: 727-510-8402.
 - 3. ITEC, USA Sales Agent: Frontmatec, Inc., 8301 NW101 Terrace #10, Kansas City, MO 64153. Phone: 563-582-4230.
- F. Manufacturer Options: Drawings and Specifications indicate sizes, profiles, and dimensional requirements of Firematic special equipment and are based on the specific types, models and manufacturers indicated. Other manufacturers with equal performance characteristics may be considered. Refer to Division 01 Section "Product Requirements".

2.02 SCBA STORAGE BOTTLE UNITS

- A. Heavy Duty Mobile Cylinder Storage System by GearGrid, LLC. Note: Combination cylinder/hose units acceptable
 - 1. 75" W x 26" D x 82" H.
 - 2. Shelf Configuration: as indicated on the drawings.
 - 3. Reinforced base supports 3,800 lbs.
 - 4. Casters: Locking 950 lb. capacity each
 - 5. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.
- B. Mini Mobile SCBA Cylinder Storage Unit by GearGrid, LLC.
 - 1. Shelves: 8 for SCBA Bottles.
 - 2. Size: 50" W x 20" D x 59" H.
 - 3. Casters: Locking type, 250 lbs. capacity each.
 - 4. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.

2.03 HOSE STORAGE UNIT

- A. Heavy Duty Mobile Hose Storage System by GearGrid, LLC.
 - 1. 75" W x 26" D x 82" H.
 - 2. Shelf Configuration: as indicated on the drawings.
 - 3. Reinforced base supports 3,800 lbs.
 - 4. Casters: Locking 950 lb. capacity each
 - 5. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.

- B. Mini Mobile Hose Storage System with Winder by GearGrid, LLC.
 - 1. Shelves: 5 with adjustable book-end supports
 - 2. One hose winder to accommodate up to 1000' of 2-1/2" hose.
 - 3. Size: 50" W x 20" D x 59" H.
 - 4. Casters: Locking type-250 lbs. capacity each.
 - 5. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.

2.04 WORKSTATION (WORK BENCH)

- A. Model:
 - 1. Slinger Workstation with Slinger Topside Wall Mount Shelf and Slinger Tool Grid as manufactured by GearGrid, LLC.
 - 2. Size:
 - a. 51" W x 30" D x 41" H.
 - b. 4' W Slinger Top-side Wall Mount Shelf.
 - c. 4' W x 25 ¹/₄" H wall mounted Slinger Tool Grid
 - 3. Construction
 - a. Frame and Doors: 1 ¹/₄" Heavy Duty Tubing.
 - b. Side and Back Grids: High-Strength 1/4" wire, 3" x 3" square grid pattern.
 - c. Provide three (3) secure doors with padlock hasps.
 - d. Work Surface: Brushed Stainless Steel, Black Laminate, Butcher Block, Granite Laminate.
 - e. Locking Casters.
 - 4. Standard Accessories:
 - a. Four (4) Large tool hangers.
 - b. Two (2) four-prong racks.
 - 5. Optional Accessories:
 - a. Bench Vise.
 - b. Workstation Pad.
 - c. Flat Shelves or as indicated on the drawings.
 - d. ____ SCBA Shelves or as indicated on the drawings.
 - e. Power Strip.
 - 6. Finish
 - a. Super Durable TGIC powder coat.
 - b. Color as selected by Architect from manufacturer's 7 standard colors and 8 optional colors.

2.05 HOSE DRYER

- A. Wall-Mount Hose Dryer by GearGrid, LLC.
 - 1. Size: or as indicated on the drawings.
 - 2. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.
- B. Mobile Hose Dryer by GearGrid, LLC.
 - 1. Size: 125" W x 36" D x 65" H
 - 2. Casters: Locking type; 250 lbs. capacity each.
 - 3. Option: Hose Winder with removable handle.
 - 4. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.
- C. Outdoor Hose Drying Rack by GearGrid, LLC.
 - 1. Size: 5' W x 48' L x 3-1/2" H

- 2. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.
- 2.06 AIR PACK RACK

A. ____

- 2.07 BROOM & WASH CENTER
 - A. GearGrid Broom Center by GearGrid, LLC.
 - 1. Size: 25-1/4" W x 6' Long.
 - 2. Tool Hangers: 3
 - 3. Four Prong Racks: 1
 - 4. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.
 - B. GearGrid Wash Center by GearGrid, LLC.
 - 1. Size: 25-1/4" W x 4' Long.
 - 2. Tool Hangers: 3
 - 3. Four Prong Racks: 1
 - 4. Finish: TGIC Powder Coat Color as selected by the Architect from manufacturer's standard colors.
- 2.08 VEHICLE DETAIL CENTER

Α.

2.09 TURN OUT GEAR DRYERS - "SKELTON STYLE"

- A. Dehydrator Gear Dryer by C & H Dehydrators, Inc.
 - 1. Model: DEHY-4 (48" long).
 - 2. Construction: Structural Aluminum.
 - 3. Casters: 5" Diameter ball bearing swivel type.
 - 4. Heater: 2700-Watt Heaters.
 - 5. Thermal Safety Switch.
 - 6. Electric: 240V, 14.8 Amps, 60 HZ.
- B. RAM Air Gear Dryer
 - 1. Model: TG-8H
 - 2. Maximum Number of Gear Sets: Eight (8), Accessory Drying Ports: Twenty-four (24).
 - 3. Size: 111.7" L x 28.0" W x 77.8" H.
 - 4. Construction: Stainless Steel, 12 gauge steel, powder coat paint.
 - 5. Motor Power: 1 HP.
 - 6. Air Flow: 800cfm.
 - 7. Electric: 240/60/1, 30 amp breaker required (208/60/3 available upon request).
 - 8. Maximum Temperature: 103 degrees F.
 - 9. Control Type: Touchscreen.

2.10 TURN OUT GEAR DRYERS - "CABINET STYLE"

- A. Dual Purpose Dryer by Circul-Air Corp.
 - 1. Model: D6XX
 - 2. Includes: 10 Shelves, 6 gear hangers and 6 glove and boot hangers.
 - 3. 12-hour timer shut down.
 - 4. 10-year warranty.

- 5. Conforms to NFPA 1851.
- B. PPE Express Dryer by Circul-Air Corp.
 - 1. Model: E6XX.
 - 2. Includes: 4 Shelves, 6 gear hangers amd 6 glove hangers.
 - 3. 10-year warranty.

2.11 TOOL STORAGE CHEST

- A. 26" Wide 5 drawer rolling tool cabinet by Craftsman.
 - 1. 18 20 gauge double wall construction.
 - 2. 85 lb. ball-bearing drawers with soft close latching will not slam closed.
 - 3. 1,500 lb. load rating with 5" x 2" casters and reinforced mounting casters.
 - 4. Lid stiffener provides extra stability.
 - 5. Embossed mats protect surfaces under the lid and on top of the cabinet.
 - 6. Full-grip bail and tubular side handles facilitate mobility.
 - 7. Keyed internal locking system.
 - 8. Assembled Dim, 26.5" W x 18" D x 37.5" H.
 - 9. One (1) top mat for the tool cabinet surface.
 - 10. Two (2) sets of keys.

2.12 WORK TABLE

- A. 60" long x 42" deep x 42" high open bottom work table.
 - 1. Formaspace, 1100 East Howard Lane, Suite 400, Austin, TX 78753 Phone: 800-251-1505.
 - 2. Weldmark Style (no lower leg cross members).
 - 3. Capacity: 1500 lbs.
 - 4. Stainless steel top.
 - 5. Frame Finish: Clear Coat Gloss.
 - 6. Adjustable leveler legs.

2.13 FOOTWEAR SANITIZING SYSTEM

- A. HACCP SmartStep Footwear Sanitizing System by Best Sanitizers Inc.
 - 1. Model ADB0002-BS SmartStep Sanitizing unit with scrubber and handle.
 - 2. One--Alpet D2 Surface Sanitizer 5 gallon pail (including insert, dip tube, and shipping cap).
 - 3. One Instructional Poster for SmartStep Sanitizing Unit with scrubber.

PART 3 EXECUTION

3.01 ASSEMBLY

A. Assemble in accordance with manufacturer's instructions.

3.02 INSTALLATION

A. Install and/or place Firematic Units as indicated on Contract Drawings.

3.03 CLEANING AND PROTECTION

A. Clean units prior to Substantial Completion.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.
- B. Section 092116 Gypsum Board Assemblies: Substrate for window shade systems.
- C. Section 095100 Acoustical Ceilings: Shade Pockets, pocket closures and accessories.

1.03 REFERENCE STANDARDS

- A. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- B. NFPA 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- C. WCMA A100.1 Standard for Safety of Window Covering Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.
- B. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- C. Selection Samples: Include fabric samples in full range of available colors and patterns.
- D. Verification Samples:
 - 1. Minimum size 6 inches square, representing actual materials, color and pattern of each shade type material.
- E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty 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 five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.
 - 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manually Operated, Roller Shades:
 - 1. Mecho Systems Single and Dual Roller type shade systems.
 - a. MechoShade Systems LLC; Mecho/5x: www.mechoshade.com/#sle.
 - 2. Architect approved equivalent

2.02 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Roller Shades Type RS-1 Basis of Design: MechoShade Systems LLC; Mecho/5x System; www.mechoshade.com/#sle.
 - 1. Description: Single roller, manually operated fabric window shades.
 - a. Drop Position: Regular roll.
 - b. Mounting: Ceiling mounted.
 - c. Size: As indicated on drawings.
 - d. Fabric: As indicated under Shade Fabric article.
 - 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Steel, 1/8 inch (3 mm) thick.

- b. Multiple Shade Band Operation: Provide hardware as necessary to operate more than one shade band using a single clutch operator.
- 3. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 - d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
- 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
- 5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - a. Provide a permanently lubricated brake assembly mounted on a oil-impregnated hub with wrapped spring clutch.
 - b. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.
 - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
- 6. Drive Chain: Continuous loop stainless steel beaded ball chain, 100 pound (45 kg) minimum breaking strength. Provide upper and lower limit stops.
 - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
- 7. Accessories:
 - a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; baked enamel finish.
 - 1) Fascia to be capable of installation across two or more shade bands in one piece.
 - 2) Color: Quaker Bronze.
 - 3) Profile: Square.
 - 4) Configuration: Continuous, fascia extends past continuous bracket.

2.03 SHADE FABRIC

- A. Basis of Design: Shade fabric as manufactured by Mecho.
 - 1. Solar Shadecloths:
 - a. Fabric: EcoVeil Screens: 1350 series. 5 percent open, 2 by 2 dense basket-weave pattern.
 - 1) Locations: All exterior window locations within project and Curtain Wall 'M'.

2.04 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: As recommended in writing by manufacturer.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 - 2. Horizontal Dimensions Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch (19.05 mm) total.
- C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- C. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured standard casework, with cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

1.03 REFERENCE STANDARDS

- A. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- B. BHMA A156.9 Cabinet Hardware; 2020.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Component dimensions, configurations, construction details, joint details, and attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
- C. Shop Drawings: Indicate casework types, sizes, locations, using large scale plans, elevations, cross sections. Include rough-in and anchors, placement dimensions and tolerances, clearances required, and keying information.
- D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches (51 mm by 75 mm).
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Maintenance Data: Manufacturer's recommendations for care and cleaning.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section during handling and installation, including finished surfaces and hardware items. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Accept casework on site. Inspect on arrival for damage.
- C. Coordinate size of access and route to place of installation.

1.06 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year warranty against defects. Complete forms in Owner's name and register with manufacturer. Covered defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.

- 2. Discoloration or lack of finish integrity.
- 3. Cracking or peeling of finish.
- 4. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Casework:
 - 1. Kewaunee Scientific Corp; ____: www.kewaunee.com/#sle.
 - 2. MultiLab LLC; ____: www.multilab.net/#sle.
 - 3. Fisher American LLC; www.fisheramerican.com

2.02 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.
 - 1. Style: Inset square edge.
 - 2. Primary Cabinet Material: Cold-rolled steel.
 - Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with the following front-to-back dimensions:
 Base Cabinets: 24 inches (610 mm).
 - 4. Steel Sheet Metal:
 - a. Gables, Front and Back Panels, Gusset Plates, Aprons, and Rails: 18 gauge, 0.0478 inch (1.21 mm) minimum thickness.
 - b. Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gauge, 0.0359 inch (0.91 mm) minimum thickness.
 - c. Backing Sheet to Door and Door Fronts: 22 gauge, 0.0299 inch (0.76 mm) minimum thickness.
 - 5. Structural Performance: Provide components that safely support the following minimum loads, without deformation or damage:
 - a. Base Units: 500 pounds per linear foot (744 kg/linear m) across the cabinet ends.
 - 6. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
 - 7. Edges and Seams: Smooth. Form counter tops, shelves, and drain boards from continuous sheets.
 - 8. Shelf Edges: Turned down 3/4 inch (19 mm) on each side and returned 3/4 inch (19 mm) front and back.
 - 9. Ends: Close open ends with matching construction.
 - 10. Welding: Electric spot welded; joints ground smooth and flush.
 - 11. Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware.
 - a. Fill with sound-deadening core.
 - 12. Fittings and Fixture Locations: Cut and drill countertops, backs, and other casework components for service outlets and fixtures.
 - 13. Filler Panels: Flanged on both sides, of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
 - 14. Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials, and to separate dissimilar metals.

2.03 CABINET HARDWARE

- A. Manufacturer's standard types, styles and finishes, and as indicated below.
- B. Comply with BHMA A156.9 requirements.
- C. Shelves in Cabinets:
 - 1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.
- D. Swinging Doors: Hinges, pulls, and catches.
 - 1. Hinges: Visible, number as required by referenced standards for width, height, and weight of door.
 - a. Visible Hinges: Installed on framed cabinet face, and on door face, bright chromium plated over nickel on base material.
 - b. Concealed Hinges: Installed in cabinet edge, and on door back, bright chromium plated over nickel on base material.
 - 2. Pulls: Chrome wire pulls, 4 inches (102 mm) wide.
 - 3. Catches: Magnetic.
- E. Drawers: Pulls and slides.
 - 1. Pulls: Chrome wire pulls, 4 inches (102 mm) wide.
 - 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.04 MATERIALS

A. General: Manufacturer's standard materials for units specified, unless otherwise indicated.

2.05 FINISHES

- A. Metal (Except Stainless Steel): Degrease and phosphate etch followed by primer; minimum two coats baked epoxy; _____ color as selected.
- B. Shop finish all components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of support framing and anchors.

3.02 INSTALLATION

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- C. Use anchoring devices to suit conditions and substrate materials encountered.
- D. Set casework items plumb and square, securely anchored to building structure, with no distortion.
 - 1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions require more than 3/4 inch (19 mm) leveling

adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

- E. Align cabinets to adjoining components.
- F. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch (1.6 mm). In addition, do not exceed the following tolerances:
 - 1. Variation of tops of Base Cabinets from Level: 1/16 inch (1.6 mm) in 10 feet (3 m).
 - 2. Variation of Faces of Cabinets from a True Plane: 1/8 inch (3 mm) in 10 feet (3 m).
 - 3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
 - 4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.6 mm).
- G. Field touch-up blemishes to original finish.

3.03 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, fixtures to function smoothly.

3.04 CLEANING

A. Clean casework, counters, shelves, glass, legs, hardware, fittings and fixtures.

3.05 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.
- C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

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 088000 Glazing
- C. Section 092116 Gypsum Board Systems

1.02 SUMMARY

- A. This Section includes providing built-in Display Case(s) including but not limited to: sliding glass door system, standards and wall brackets for providing support for adjustable glass shelving, and interior back and side wall mirror finishes within the display case(s).
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 061000 Rough Carpentry
 - 2. Section 062000 Finish Carpentry
 - 3. Section 088000 Glazing
 - 4. Section 088300 Mirrors
 - 5. Section 092116 Gypsum Board Assemblies
 - 6. Division 26 Electrical for light fixtures

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. Cabinet Standard: ANSI A161.1.

1.04 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016000 Product Requirements.
- C. Product Data: Submit manufacturer's technical product data and installation instructions indicating materials, hardware, and finishes used in fabrication of display case, as required to show compliance with specifications.
- D. Shop Drawings: Submit shop drawings indicating location and size of each display case, accessories, materials, finishes, hardware types and locations, fillers, etc. Include fully dimensioned plans and elevations and indicate details of anchorage to 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.
- B. Verify display case dimensions to field measurements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturers' published instructions.

- B. Protect against moisture exposure and damage.
- C. Protect material during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- D. Do not install display case until painting, wet work, grinding and similar operations, which could be performed before installation of display case, have been completed in installation areas.

1.07 JOB CONDITIONS

- A. Conditioning: Comply with manufacturer's recommendations for temperature and humidity requirements in installation areas. Do not install display cases until required temperature and relative humidity have been stabilized and will be maintained in installed areas.
- B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed display case work within a tolerance range of the optimum moisture content acceptable to cabinet manufacturer, from date of installation through remainder of construction period.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Knape & Vogt Manufacturing Company (KV), 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505, Phone 800-253-1561.
- B. Architect Approved Equivalent.

2.02 SLIDING DOOR TRACK COMPONENTS (3/8" THICK TEMPERED GLASS)

- A. Aluminum Top and Jamb Tracks.
 - 1. KV #1093 Double Channel Track.
 - 2. KV #1085 Vinyl Top Guide.
- B. Aluminum Bottom Track.
 - 1. KV #1093 Double Channel Track.
 - 2. KV #1096 Single Track Insert.
 - 3. KV #1095 Shoe, Shoe Length equals width of individual door.
 - 4. KV ##1097 Nylon Roller Press.
- C. Accessories.
 - 1. KV #1087 Rubber Bumper (3 required in each jamb track).
 - 2. KV #836 Sliding Door pull.
 - 3. KV #965KA 50 NP Lock with two(2) keys per lock. All display case locks to be keyed alike. a. Finish: Polished Nickel.
- D. Finish.
 - 1. All track and accessory components shall have an anodized finish unless noted otherwise.

2.03 SHELVING SUPPORT COMPONENTS

- A. Shelving (3/8" Thick Tempered Glass).
 - 1. Standards: KV #87 7/8" wide x 11/16" deep Super-Duty Single Slot Anochrome finish.
 - 2. Brackets: KV #187 12" Anochrome finish 12 gauge bracket.

2.04 DISPLAY CASE DOORS, SHELVES, BACK, SIDE, & BOTTOM PANELS

- A. Sliding Doors
 - 1. 3/8" Tempered Glass MG-1 See Section 088000 Glazing
- B. Glass Shelves:
 1. 3/8" Tempered Glass MG-1 See Section 088000 Glazing
- C. Back and Side Display Case Panels
 - 1. Fabric covered tack board final color selection by Architect from manufacturer's complete line of basic finishes.
 - 2. 3/4" Plywood sub panel.
- D. Display Case Bottom
 - 1. 5/8" AC Plywood Stained and finished with three (3) coats of polyurethane.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect substrate and conditions under which display cases are to be installed.

3.02 BLOCKING

A. Contractor shall provide blocking in walls for display case standards and other required supports.

3.03 INSTALLATION

- A. Install display case(s) plumb, level, true and straight with no distortions.
- B. Complete hardware installation and adjust for proper operation.
 - 1. Verify back side of aluminum tracks and shoes are clean. These surfaces will be visible in the display case rear mirrors.
- C. Install Double Channel track top and bottom.
 - 1. Three door system requires two doors on same track.
- D. Sliding Glass Doors shall overlap each other: One (1) inch.
- E. Provide a ratchet lock on all door pairs.
- F. Provide standards located 8" from the ends of each shelf and at a maximum spacing of 24" o.c. Standards shall run full height of display case.
 - 1. Secure standards to concealed blocking with countersunk screws matching standard finish.
- G. Provide shelving brackets as required for a complete installation.
- H. Butt mirror to standards. Mirror seams to conform to standard's spacing. Standards shall run full height of display case.
- I. Glue mirror to gypsum wall boards per adhesive manufacture recommendations.
- J. Coordinate with Electrical Contractor for installation of display case lighting.

3.04 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

K. Verify glass doors slide smoothly within their individual track systems.

B. Clean exposed and semi-exposed surfaces, touch-up as required. Remove and refinish damaged or soiled areas.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Countertops for manufactured casework.
- C. Wall-hung counters and vanity tops.

1.02 REFERENCE STANDARDS

- A. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- B. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) North American Architectural Woodwork Standards; 2021, with Errata.
- D. IAPMO Z124 Plastic Plumbing Fixtures; 2022.
- E. ISFA 3-01 Classification and Standards for Quartz Surfacing Material; 2013.
- F. MIA (DSDM) Dimensional Stone Design Manual, Version VIII; 2016.
- G. NEMA LD 3 High-Pressure Decorative Laminates; 2005.
- H. PS 1 Structural Plywood; 2009 (Revised 2019).

1.03 SUBMITTALS

- A. See Section 013300 SUBMITTALS, for submittal procedures.
- B. 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.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification:
 - 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.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD 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 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
 - 1. Flat Sheet Thickness: 3/4 inch (19 mm), minimum.
 - Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 a. Manufacturers:
 - 1) Wilsonart Quartz
 - 2) Cambria Quartz; www.cambriausa.com
 - b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
 - c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - d. NSF approved for food contact.
 - e. Sinks: Separate units for undercounter mounting; minimum 3/4 inch (19 mm) wall thickness; comply with IAPMO Z124.
 - f. Finish on Exposed Surfaces: Polished.
 - g. Color and Pattern: As selected by Architect/Engineer from manufacturer's full line.
 - 3. Other Components Thickness: 3/4 inch (19 mm), minimum.

- 4. Exposed Edge Treatment: Built up to minimum 1 1/2 inch (38.1 mm) thick; Eased Leading Edge; use marine edge at sinks.
- 5. Back and End Splashes: Same sheet material, Eased Top Edge top; minimum 4 inches (102 mm) high.
- 6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 Countertops, Premium Grade.

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches (102 mm), unless otherwise indicated.
- C. Solid Synthetic Surfacing: Fabricate tops up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide brackets and braces as indicated on drawings, finished to match.

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/Engineer of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.
- 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. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.
- B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.
- C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly in manufacturer's instructions.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

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 and holes, 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 with a minimum of three (3) years of documented installation experience for projects of similar scope, complexity and size. Installer shall be currently certified by the manufacturer as an approved installer.

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.

1.09 WARRANTY

A. Manufacturer's Limited Warranty: Provide manufacturer's standard Ten(10) - Year Commercial Limited Warranty against defects in solid surface sheet materials.

PART 2 - PRODUCTS

2.01 SOLID SURFACE 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. Wilsonart LLC.: Wilsonart Solid Surface.
 - b. E. I. du Pont de Nemours and Company: Corian (Basis of Design)
 - c. Architect approved equivalent.
 - 2. Colors and Patterns: Deep Titanium and As indicated on the drawings
 - 3. Composition: Acrylic resins, fire-retardant mineral fillers, and proprietary coloring agents. Through-the-body color for full thickness of sheet material.
 - 4. Edge Detail: As indicated on the drawings.
 - 5. Physical Characteristics:

| Characteristic | Test | Results |
|---------------------------------|-----------------------|-------------------------------|
| Tensile Strength: | ASTM D638 | 6800 psi |
| Tensile Modulus | ASTM D638 | 1.5 x 10^6 psi |
| Tensile Elongation | ASTM D638 | 0.4 percent minimum |
| Flexural Strength | ASTM D790 | 10,000 psi |
| Flexural Modulus | ASTM D790 | 1.5 x 10 ^6 psi |
| Thermal Expansion Coefficient | ASTM D696 | 1.37 x 10^5 in./in. degree F |
| Hardness (Barcol Impressor) | ASTM D2583 | 55-62 |
| Impact Resistance: | NEMA LD 3 | 144 inches drop - no fracture |
| Izod Impact: 0.28 (ft-lb.)/in. | ASTM D256 - method A | 0.28 ft-lbs/in. |
| Light Resistance - Xenon | NEMA LD 3, Method 3.3 | no effect |
| Stain Resistance | ANSI 124.3 modified | Pass |
| Wear and Cleanability | ANSI 124.3 modified | Pass |
| Fungi Resistance | ASTM G21 | Pass |
| Bacterial Resistance: | ASTM G22 | Pass |
| Boiling Water Resistance: | NEMA LD 3 | No effect |
| High Temperature Resistance: | NEMA LD 3 | No effect |
| Weatherability: | ASTM G155 | Delta E less than 5 |
| Moisture Absorption | ASTM D570 | Less than .25 percent |
| Specific Gravity | ASTM D792 | 1.7 gram/cm^3 |
| Weight | | 4.4 lbs./sq. ft. |
| Surface Burning Characteristics | ASTM E84 | Class I and Class A |

B. Solid Surface Material: Solid phenolic flat panels based on 30% thermosetting resins homogeneously reinforced with 70% wood fibers and manufactured under high pressure and temperature to form a composite panel. Solid phenolic composite panel construction with black core. Panels to have an integrated, decorative surface with pigmented resins cured using 'Electron Beam Curing' (EBC) technology, rendering the panel highly chemical resistant and highly antibacterial activity of > 99.99% reduction after 24 hours using testing method based on JIS Z 2801: 2000.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Corian® by DuPont; www.corian.com
 - b. Architect approved equivalent.
- 2. Thickness: 3/4" (20mm) minimum.
- 3. Finish: Semi-gloss Finish.
- 4. Exposed edge Finish: 1/8 inch bevel (3mm).
- 5. Backs and Side Splashes: Supplied loose, cut to size, field applied in the same material and color as countertops. Include top mounted end curb where work surfaces abut walls, cabinets, fume hoods, and locations detailed on Drawings.
 - a. Thickness: 3/4 inch (20mm).
 - b. Height: 4 inches.
 - c. Attachment: Backsplash and return side splash curbs will be bonded to the tops at the jobsite with two part epoxy resin adhesive.
 - d. Seamless Length: 97 inches (2464mm) for 3/4 inch thick material.
- 6. Drip Grooves: 1/8 inch (3mm) depth, 1/8 inch (3mm) width, set back 1/2 inch (12.5mm) from the front edge on the underside of exposed edges.
- 7. Colors and Patterns: Deep Titanium.
- 8. Fire resistance: Core meets Underwriters Laboratories (UL) Class A fire resistance per ASTM E 84.
- 9. Physical Characteristics:

| Characteristic | Test | Results |
|--|----------|--|
| Shear Strength: Tensile Modulus | | 2000 psi minimum 1.5 x 10^6 psi 24,000 psi minimum |
| Compressive Strength Modulus of Elasticity Chemical Resistance | SEFA 8 | 24,000 psi minimum 1.5 x 10 ^6 psi Pass |
| Microbial Characteristics Porosity Weight | | will not support growth nonporous surface / edges 93 pcf maximum |
| Surface Burning Characteristics | ASTM E84 | Class I and Class A |

C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.02 FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Premium.
- B. Configuration:
 - 1. Front: Eased edge with apron 1 1/2 inch high with edge as indicated on the drawings..
 - 2. Backsplash: Straight, with edge as indicated on the drawings. top edge and vertical corner edges.
 - 3. End Splash: 4 inch height.
- 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: Methacrylate-based adhesive for chemically bonding solid surfacing seams or product recommended by solid surface material manufacturer.
 - 1. Color complementary to solid surfacing sheet material.
 - 2. Adhesives shall have a VOC content of 70 g/L or less.
 - 3. 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."
 - 4. Product: Wilsonart Hard Surface Adhesive or Architect approved equivalent compatible with the approved material.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 JOINT SEALANTS.
 - 1. Material shall comply with ASTM C920, Type S (single component), Grade NS (non-sag).
 - 2. Color: Complementary to the solid surface material color

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.

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 Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Recessed Aluminum Floor Mats and Frames. Locations and sizes indicated on the Contract Drawings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete work, including forming, placing, and finishing concrete floor slabs, and for concrete materials for grouting and filling around and under recessed mats and frames.
 - 2. Section 096715 Epoxy Seamless Flooring System for abutting adjoining materials.

1.03 SUBMITTALS

- A. Pursuant to Section 013300 Submittal Procedures.
- B. Pursuant to Section 016100 Product Requirements.
- C. Product Data: Include manufacturer's specifications and installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of floor mat and frame specified.
- D. Shop Drawings: For floor mats and frames. Show assembly, joint locations, installation details, layout, plans, elevations, sections, details of patterns or designs, accessories, anchors, and attachments to other Work.
- E. Samples for Initial Selection: For each type of floor mat and frame indicated.
- F. Samples for Verification: 12-inch-square assembled sections of floor mats, frame members, and tread rails with selected tread surface showing each type of metal finish and color of exposed floor mats, tread rails, frames, and accessories required.
- G. Maintenance Data: For cleaning and maintaining floor mats to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify blocked-out openings in floors by field measurements before fabrication and indicate measurements on Shop Drawings.

1.06 COORDINATION

A. Coordinate size and location of oversized recesses in concrete work to receive floor mats and frames. Defer frame installations until building enclosure is completed and related interior finish

work is in progress. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate integral installation of recessed frames and anchors with placing of concrete slab so frames are positioned accurately.

1.07 WARRANTY

A. Floor mats and frames shall be fabricated free of defects in materials and workmanship in accordance with the General Conditions, and the manufacturer shall offer a 2-year warranty against defects in materials and workmanship.

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:
 - 1. Roll-Up Aluminum Rail Hinged Mats:
 - a. Babcock-Davis (Basis of Specification)
 - b. Balco, Inc.
 - c. KADEE Industries, Inc.
 - d. Architect Approved Equivalent.

2.02 MATERIALS

- A. Aluminum Frames: Extruded Aluminum; ASTM B221, alloy 6063-T5, with butted corners and factory coated with zinc chromate or manufacturer's standard protective paint where surfaces will be in contact with concrete.
 - 1. Finish: As selected by Architect from manufacturer's standard colors and finishes.
- B. Mat Description:
 - 1. Apparatus Bay Decon Transition Zone Locations:
 - a. GRATEDesign® Roll up Grate.
- C. Rail Support and leveling Device: Manufacturer's standard device to support the rails from excessive deflection, spaced 24-inches o.c., and to provide adjustment for level installation.
- D. Construction: Hollow extrusion (not U shape) rails joined by low-density polyethylene (LDPE) hinge and cushion retained in "captive" aluminum tread port, with drainage to allow debris and moisture to flow through grate. Tread hinges to be secured with rigid PVC end cap. Fillers shall be serrated black vinyl for use in creating a snug fit for the grate.
- E. Apparatus Bay Transition Zone Tread Inserts: Provide alternating tread inserts of rugged scrub insert and serrated rail.
 - 1. Tread colors: As selected by Architect from manufacturer's standard colors.
- F. Fasteners: Non-corrosive screws and anchors for securing frames together and to floors.

2.03 FABRICATION

- A. General: Verify sizes by field measurement before shop fabrication.
- B. Floor Mats: Shop fabricate units to greatest extent possible in sizes as indicated. If not 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.

- C. Recessed Metal Mat Frames: Extruded aluminum of size and style to fit floor mat type specified, 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.
- D. With manufacturer's standard protective coating, coat surfaces of aluminum frames that will contact cementitious material.

2.04 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" 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.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, floor conditions, and floor recesses for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
 - 1. 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 top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.
 - 1. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
 - 2. 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.
- B. Install tread mat only when no further wheeled construction traffic will occur and wet type operations including painting and decorating are complete.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provide pre-engineered building systems, including but not limited to primary and secondary structural framing systems, roofing, siding, roof and wall insulation, personnel doors, windows and accessories. Basis of design is the following system by Lester Building Systems:
 - 1. Uni-Frame II, clear span truss and above grade columns on concrete foundation.

1.02 REFERENCES

- A. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- D. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.
- E. ASTM C1036 Standard Specification for Flat Glass; 2021.
- F. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- G. ASTM C140/C140M Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2022b.
- H. ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).
- I. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- J. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units; 2022.
- K. ASTM C991 Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings; 2023.
- L. ASTM D3363 Standard Test Method for Film Hardness by Pencil Test; 2022.
- M. ASTM D3462/D3462M Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.
- N. ASTM D3841 Standard Specification for Glass-Fiber-Reinforced Polyester Plastic Panels.
- O. ASTM D4145 Standard Test Method for Coating Flexibility of Prepainted Sheet; 2010 (Reapproved 2018).
- P. ASTM D523 Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- Q. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

- R. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.
- S. ICC (IBC) International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SYSTEM DESCRIPTION

- A. Structural Frame Design:
 - 1. Design shall be based on the building framing and enclosure as manufactured by Lester Building Systems or approved equal.
 - a. Type: Clear span roof truss or rafter style roof framing with interior column lines.
 - b. Maximum Width: 124 feet.
 - c. Maximum Clear Height: 30 feet.
 - d. Columns: Embedded in ground or Bolted to foundation.
 - e. Purlins: Recessed between trusses with galvanized steel joist hangers.
- B. Dimensions:
 - 1. Width: As indicated on the drawings.
 - 2. Length: As indicated on the drawings.
 - 3. Height: ______ feet _____ inches, clearance from top of floor to underside of truss or rafter or As indicated on the drawings.
 - 4. Roof Slope: _____:12 (units of rise per 12 units of run).
 - 5. Ceiling Slope: _____:12 (units of rise per 12 units of run).
- C. Structural Requirements:
 - 1. Building Code: International building Code ICC (IBC), New York State Building Code, and ASCE 7.
 - 2. Design Loads:
 - a. Ground Snow Load: ____ p.s.f. or as indicated on the drawings
 - b. Ground Exposure Factor:
 - c. Roof Load, Live load: _____psf or As indicated on the drawings.
 - d. Roof Dead Load: _____psf or As indicated on the drawings.
 - e. Ceiling Dead Load: ____ psf or As indicated on the drawings.
 - f. Wind Load: Wind speed (3 sec gust): ___ mph or As indicated on the drawings.
 - g. Wind Exposure: Maximum Considered Earthquake 0.2 Second Spectral Response Acceleration.
 - h. Maximum Considered Earthquake 1.0 Second Spectral Response Acceleration.
 - i. Collateral Loads: Additional loads imposed by contract documents other than weight of building systems specified in this section.
 - j. Combination Loads: Comply with applicable Building Code.
 - 3. Structural Design:
 - a. Perform calculations using diaphragm and/or frame analysis. Incorporate bracing as required.
 - b. Comply with AFPA (NDS) "National Design Specification for Wood Construction (NDS)."
 - c. Trusses:
 - 1) Limit deflection for live or snow loads to L/240 for trusses supporting steel ceilings and to L/180 for overhangs and trusses not supporting ceilings.
 - 2) Limit deflection for live or snow loads to L/360 for trusses supporting GWB or plaster ceilings and to L/180 for overhangs and trusses not supporting ceilings.
 - 3) Comply with appropriate NDS and Truss Plate Institute (TPI) standards.
 - d. Metal Wall and Roof Panels:

- 1) Design in accordance with AISI "Specifications for the Design of Light-Gauge, Cold-Formed Steel Structural Members" and in accordance with sound engineering methods and practices.
- e. Plywood or Oriented Strand Board Sheathing: Comply with APA "Plywood Design Specification." ASTM D3363
- f. Expansion/Contraction Provisions: Design roof attachment system to allow for expansion and contraction of metal roofing, due to seasonal temperature variations, without detrimental effect to the roof panels.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 SUBMITTALS.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's specifications and installation instructions for building components and accessories.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
- C. Shop Drawings: Showing roof framing, cross sections, roof and wall covering and trim details and accessory and component details clearly indicating proper assembly.
- D. Structural Engineer Certification: Letter signed by a Professional/Structural Engineer, registered to practice in the jurisdiction of the project, verifying compliance with Snow Design Requirements. Letter shall reference specific dead loads, live loads, wind loads, tributary area load reductions (if applicable) collateral loads, seismic loads, end use categories, and governing building code including edition and load applications.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum ten (10) years experience in producing pre-engineered wood buildings of the type specified.
- B. Installer Qualifications: Installer Qualifications: Minimum three (3) years experience in erection of pre-engineered wood buildings of the type specified.
- C. Structural Engineer's Qualifications: Minimum of three (3) years designing post frame structures; registered in the jurisdiction of the project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation. Follow manufacturer's recommended storage procedures. Do not allow steel siding and roofing to contact the ground.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.07 PROJECT CONDITIONS

A. Anticipate 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.

1.08 WARRANTY

- A. Structural Design Lifetime: Manufacturer warrants that the building designed by the approved building system company will not experience an occurrence of structural failure or an occurrence of structural damage due to improper structural design (excepting ventilation systems) on account of weather conditions, such as wind, ice, and snow, as indicated on the Lester Building Systems Sales Agreement, "Building Description Section". The foregoing warranty is limited to fifty (50) years with respect to any Owner which is not an individual.
- B. Preservative Treated Materials: fifty (50) years. Preservative treated lumber, including structural columns, are warranted by the original materials manufacturer against failures due to fungal decay and termite infestation.
- C. Roofing and Siding Finish, steel panel: Warranted by the original materials manufacturer forforty (40) forty (40) years from the date of shipment. Refer to Warranty document for complete details.
- D. Individual Building Products: Manufacturer's standard warranty.
- E. Installation Warranty: one (1) year general installation warranty, five (5) years against roof leaks.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Lester Building Systems, which is located at: 1111 2nd Ave. S.; Lester Prairie, MN 55354; Toll Free Tel: 800-826-4439; Tel: 320-395-2531; Fax: 320-395-2969; Email:request info (sbeste@lesterbuildings.com); Web:www.lesterbuildings.com
- B. Substitutions: See Section 012500 PRODUCT SUBSTITUTION PROCEDURES and Section 016100 BASIC PRODUCT REQUIREMENTS.

2.02 STRUCTURAL FRAMING

- A. Footings:
 - 1. Embedded Column Footings:
 - a. Cast in place concrete footing of 3000 psi ready-mix concrete of size and thickness specified in the shop drawings.
 - 2. Column Foundation, Above Grade:
 - a. Cast in place frost wall and foundation. Sized and reinforced as specified in the shop drawings.
- B. Primary Framing:
 - 1. Columns:
 - a. Treated Lumber Section:
 - 1) Lumber: No. 1 or Better Southern Yellow Pine, pressure treated with Chromated Copper Arsenate, Type III, to a retention of 0.6 pcf (9.6 kg/m3) and kiln dried after treating to 19 percent maximum moisture content.

- Fabrication: Laminate individual pieces using ring shank feed nails per manufacturer's engineered nailing pattern. Fasteners shall have ASTM A153/A153M galvanizing.
- b. Untreated Lumber Section:
 - Lumber: Lumber: No. 1 or Better Southern Yellow Pine or Douglas Fir-Larch or other equivalent NDS approved species/grade kiln dried to 19 percent maximum moisture content.
 - 2) Fabrication: Laminate individual pieces using ring shank feed nails per manufacturer's engineered nailing pattern.
 - 3) Grade and size shall be selected to support imposed loads within deflection limits.
- c. End Joint Connection of Treated and Untreated Sections: Factory fabricated finger joint.
- d. Configuration:
 - Sidewall and Endwall Columns: 3 ply or 4 ply combining 2 inch x 4 inch, 2 inch x 6 inch, 2 inch x 8 inch, or 2 inch x 10 inch dimension lumber as required by "Structural Design" requirements specified herein.
 - Corner Columns: 2 ply or 3 ply combining 2 inch x 4 inch, 2 inch x 6 inch, or 2 inch x 8 inch dimension lumber as required by "Structural Design" requirements specified herein.
- e. Embedded Column Anchorage:
 - 1) Anchor blocks factory adhered to column base.
 - 2) Concrete collar pinned to column base with steel reinforcing rods.
- f. Column on Concrete Foundation: Provide screw in concrete anchors or cast-in-place anchors per shop drawings
- 2. Trusses: Comply with "Structural Design" and "Quality Assurance" requirements as specified herein.
 - a. Comply with TPI "Design Specification for Metal Plate Connected Wood Trusses" and "Quality Standard for Metal Plate Connected Wood Trusses."
 - b. Manufacturer shall have a third party inspection program to verify compliance with requirements of TPI.
 - c. Stamp trusses with inspection agency identification.
- C. Secondary Framing:
 - 1. Purlins and Girts:
 - a. Lumber: No. 2 or Better dimension lumber, kiln dried to 19 percent maximum moisture content.
 - b. Configuration: 2 inch x 4 inch, 2 inch x 6 inch, 2 inch x 8 inch, or 2 inch x 10 inch as required by "Structural Design" requirements specified herein.
 - 1) Girts: Size, grade and spacing to meet wind and deflection criterion.
 - (a) Face mounted to exterior side of column.
 - (b) Precision cut to fit between columns. Flush to exterior and interior faces.
 - 2) Purlins: Precision cut to fit between trusses flush with top of top chord. Provide 20 gauge galvanized purlin saddle hangers.
 - 3) Purlins: Factory drilled and dadoed to accept 3/16 inch diameter x 6 inch screw fastener and ensure building modularity.
 - c. Spacing: As required by "Structural Design" requirements specified herein.
 - 2. Splashplank:
 - a. Lumber: No. 2 or Better Southern Yellow Pine, preservative treated, to a retention of 14 pcf (2.2 kg/m3) of micronized copper azole.
 - b. Configuration: 2 inch x 6 inch or 2 inch x 8 inch dimension lumber. Milled S4S for single row and milled T&G for multiple rows.
 - 3. Sill Plate:

- a. Lumber: No. 2 or Better Southern Yellow Pine, preservative treated, to a retention of 0.17 pcf (B2O3) borate or (0.25 pcf disodium octaborate tetrahydrate DOT) and kiln dried after treating to 19 percent maximum moisture content.
- b. Configuration: 2 inch x 4 inch, 2 inch x 6 inch, 2 inch x 8 inch, or 2 inch x 10 inch dimension lumber as required by "Structural Design" requirements specified herein.
- 4. Bracing, Wall and Lateral Truss Type (where required by "Structural Design"):
 - a. Lumber: No. 2 or Better dimension lumber.
 - b. Configuration:
 - 1) 2 inch x 4 inch or 2 inch x 6 inch as required by "Structural Design" requirements specified herein.

2.03 EXPOSED FASTENER, LAP-SEAM, METAL ROOF PANELS

- A. Metal Roofing: UNI-RIB panel as manufactured by Lester Building Systems.
 - . Material and Finish: 28 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), AZ50 (Z180) zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:
 - 1) Bonderize and provide baked on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.9 mil (0.023 mm) minimum dry film thickness.
 - 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
 - 3) Pencil Hardness: ASTM D3363, F to 2H.
 - 4) T-Bend: ASTM D4145: 2T to 4T.
 - 5) Color: As selected by the Architect
 - 6) * Meets Energy Star reflectivity standards.
 - Material and Finish: 29 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), galvanized steel with G90 (Z275) zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:
 - Bonderize and provide baked on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.9 mil (0.023 mm) minimum dry film thickness.
 - 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
 - 3) Pencil Hardness: ASTM D3363, F
 - 4) Color: As selected by the Architect.
 - 5) * Meets Energy Star reflectivity standards.
 - 3. Material and Finish: 26 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), AZ50 zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:
 - 1) Bonderize and provide baked on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.9 mil (0.023 mm) minimum dry film thickness.
 - 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
 - 3) Pencil Hardness: ASTM D3363, F
 - 4) T-Bend: ASTM D4145: 2T to 4T.
 - 5) Color: As selected by the Architect.
 - 6) * Meets Energy Star reflectivity standards.
 - 4. Material and Finish: 26 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), AZ50 zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:
 - 1) Bonderize and provide baked on primer and factory applied, baked-on 70% Kynar 500 or Hylar 5000 PVDF fluoropolymer resin based Fluropon paint coating as manufactured by Valspar, 0.9 mil (0.023 mm) minimum dry film thickness.
 - 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
 - 3) Pencil Hardness: ASTM D3363, F to 2H.
 - 4) T-Bend: ASTM D4145: 2T to 4T.
 - 5) Color: As selected by the Architect
 - 6) * Meets Energy Star reflectivity standards.

- 5. Configuration:
 - a. Roll-formed; 36 inch (915 mm) coverage width. Provide panels covering up to 35 foot (10.5 m) lengths in single pieces.
 - b. Four major corrugations, 7/8 inch (22 mm) high, spaced 12 inches (305 mm) on center with 3 minor corrugations, 1/8 inch (3mm) high, spaced 3 inches (76 mm) on center between each major corrugation.
 - c. Form one outboard corrugation as overlapping corrugation.
 - d. Form opposite outboard corrugation as underneath corrugation with full return leg to support side lap and a continuous anti-siphon drain channel.
 e. Factory cut to required length.
- 6. Material and Finish: As shown on Erection Drawings, except as specified herein.
- 7. Fasteners: Color coated No. 10 piercing screws with 1/4 inch (6 mm) hex head pre-assembled to 1/2 inch (13 mm) O.D. dome seal or bond seal galvanized steel and EPDM washers.
- B. Basis of Design: Eclipse panel as manufactured by the approved building system company. Metal roof panels with side edges lapping adjacent panels. Secured to supports using fasteners through the major ribs.
 - 1. Configuration:
 - a. Roll-formed; 36 inch (915 mm) coverage width. Provide panels covering up to 35 foot (10.5 m) lengths in single pieces.
 - b. Three major corrugations, 7/8 inch (25 mm) high, spaced 18 inches (457 mm) on center with 3 minor corrugations, 1/8 inch (3mm) high, spaced 3 inches (76 mm) on center between each major corrugation.
 - c. Form one outboard corrugation as overlapping corrugation.
 - d. Form opposite outboard corrugation as underneath corrugation with full return leg to support side lap and a continuous anti-siphon drain channel.
 - e. Factory cut to required length.
 - 2. Material and Finish: 28 gauge steel, ASTM A792/A792M Class AZ50 Galvalume, coated both sides, 0.0157 inches (.398 mm) thick.
 - a. Exterior Surface Finish: Bonderize and provide baked-on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.7 0.8 mil minimum dry film thickness.
 - 1) Color: As selected by the Architect.
 - 2) * Meets Energy Star reflectivity standards.
 - 3. Material and Finish: 26 gauge steel, ASTM A792/A792M Class AZ50 Galvalume, coated both sides, 0.0187 inches (.474 mm) thick.
 - a. Exterior Surface Finish: Bonderize and provide baked-on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.7 0.8 mil minimum dry film thickness.
 - b. Exterior Surface Finish: Bonderize and provide baked-on primer and factory applied baked-on 70 percent Kynar 500 or Hylar 5000 PVDF fluoropolymer resin based paint coating manufactured by Valspar, with a minimum dry film thickness of 0.7 0.8 mil..
 1) Color: As selected by the Architect.
 - * Meets Energy Star reflectivity standards.
 - 4. Fasteners: DS2000 coated No. 14 piercing screws with 3/8 inch (9.5 mm) hex head pre-assembled to 1/2 inch (13 mm) O.D. dome seal or bond seal galvanized steel and EPDM washers.

2.04 CONCEALED FASTENER, LAP-SEAM, METAL ROOF PANELS

A. Basis of Design: Eclipse panel as manufactured by Lester Building Systems. Metal roof panels with side edges lapping adjacent panels. Secured to supports using fasteners through the major ribs. Fasteners concealed with snap-on batten. Include accessories required for weathertight installation.

- 1. Configuration
 - a. Roll-formed; 36 inch (915 mm) coverage width. Provide panels covering up to 35 foot (10.5 m) lengths in single pieces.
 - b. Rib profile, 1 inch (25 mm) inch high trapezoidal major ribs 18 inches on center. Reversed minor ribs 3 inch (75 mm) wide on centers spaced symmetrically.
 - c. One outboard corrugation as overlapping.
 - d. Opposite outboard corrugation as underneath corrugation with full return leg to support side lap.
 - e. Outboard side Lap Height with Batten (H by W): 1.5 by 1 inches (38 by 25 mm).
 - f. Factory cut to required length.
 - g. Eave: Hemmed.
 - h. Eave: No extension.
 - i. Eave: 4 inch (102 mm).
- 2. Material and Finish: 28 gauge steel, ASTM A792/A792M ClassAZ50 Galvalume, coated both sides, 0.0157 inches (.398 mm) thick.
 - a. Exterior Surface Finish: Bonderize and provide baked-on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.7 0.8 mil minimum dry film thickness.
 - 1) Color: As selected by the Architect
 - 2) * Meets Energy Star reflectivity standards.
- 3. Material and Finish: 26 gauge steel, ASTM A792/A792M Class AZ50 Galvalume, coated both sides, 0.0187 inches (.474 mm) thick.
 - a. Exterior Surface Finish: Bonderize and provide baked-on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.7 0.8 mil minimum dry film thickness.
 - b. Exterior Surface Finish: Bonderize and provide baked-on primer and factory applied baked-on 70 percent Kynar 500 or Hylar 5000 PVDF fluoropolymer resin based paint coating manufactured by Valspar, with a minimum dry film thickness of 0.7 0.8 mil..
 - 1) Color: As selected by the Architect.
 - 2) * Meets Energy Star reflectivity standards.
- B. Fasteners: DS2000 coated No. 14 piercing screws with 3/8 inch (9.5 mm) hex head pre-assembled to 1/2 inch (13 mm) O.D. dome seal or bond seal galvanized steel and EPDM washers.

2.05 SHINGLE ROOFING

- A. Deck Materials: APA rated sheathing, thickness and span rating as required by "Structural Design" requirements specified herein.
- B. Underlayment: Mechanically attached, coated woven synthetic roofing underlayment for sloped roofs. TITANIUM UDL-30 as manufactured by Interwrap, Inc.
- C. Shingles: ASTM D3462/D3462M, 3-tab fiberglass self-sealing shingle with Underwriters Laboratories label for wind resistance and Class A fire rating.
 - 1. Color: As selected by Architect from manufacturer's full color range.
- D. Fasteners:
 - 1. Deck Material to Structural Framing: Nail type, size and spacing as required by "Structural Design" requirements specified herein.
 - 2. Shingles to Deck Material: Nails or staples of type recommended by the shingle manufacturer to meet Wind Speed requirements noted under "Structural Requirements" under SYSTEM DESCRIPTION Article.

2.06 ROOFING ACCESSORIES

- A. Steel Ridge Cap:
 - 1. The cap materials and construction shall match the roof steel materials and construction.
- B. Vents: Ridge vent, and/or low profile ridge ventilator as shown on Drawings and as required by Roofing Shingle manufacturer (where applicable).
- C. Cupola: Provide manufacturer's standard cupola or cupola and Weathervane as indicated on the Drawings.
- D. Eave Overhang Fascia Flashing:
 - 1. Size: 24 inches nominal.
 - 2. Fascia Flashing Color: As selected by the Architect.
 - 3. Vented Soffit Color: As selected by the Architect.
- E. End Overhang Fascia Flashing:
 - 1. Size: 12 inches nominal.
 - 2. Fascia Flashing Color: As selected by the Architect.
 - 3. Vented Soffit Color: As selected by the Architect.
- F. Gutters and Downspouts: Provide manufacturer's standard gutters and downspouts as indicated on the Drawings.
- G. Closure Strips: Closed cell, 2 pcf density polyethylene foam, premolded to match configuration of panels.
- 2.07 SIDING
 - A. Siding: UNI-RIB panel as manufactured by the approved building system company.
 - 1. Material and Finish: 28 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), AZ50 (Z180) zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:
 - Bonderize and provide baked on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.9 mil (0.023 mm) minimum dry film thickness.
 - 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
 - 3) Pencil Hardness: ASTM D3363, F to 2H.
 - 4) T-Bend: ASTM D4145: 2T to 4T.
 - 5) Color: As selected by the Architect.
 - 6) * Meets Energy Star reflectivity standards.
 - Material and Finish: 29 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), galvanized steel with G90 (Z275) zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:
 - 1) Bonderize and provide baked on primer and Valspar Weather-XL (silicone modified polyester) finish coat, 0.9 mil (0.023 mm) minimum dry film thickness.
 - 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
 - 3) Pencil Hardness: ASTM D3363, F.
 - 4) Color: As selected by the Architect.
 - 5) * Meets Energy Star reflectivity standards.
 - 3. Material and Finish: 26 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), AZ50 (Z180) zinc coating both sides, Triple Spot Test.
 - a. Exterior Surface Finish:

- Bonderize and provide baked on primer and factory applied, baked-on 70% Kynar 500 or Hylar 5000 PVDF fluoropolymer resin based Fluropon paint coating as manufactured by Valspar, 0.9 mil (0.023 mm) minimum dry film thickness.
- 2) Gloss (60 Degrees): ASTM D523, 20 to 80.
- 3) Pencil Hardness: ASTM D3363, F to 2H.
- 4) T-Bend: ASTM D4145: 2T to 4T.
- 5) Color: As selected by the Architect.
- 6) * Meets Energy Star reflectivity standards.
- 4. Configuration:
 - a. Roll-formed; 36 inch (915 mm) coverage width. Provide panels covering up to 35 foot (10.5 m) lengths in single pieces.
 - b. Four major corrugations, 7/8 inch (22 mm) high, spaced 12 inches (305 mm) on center with 3 minor corrugations, 1/8 inch (3 mm) high, spaced 3 inches (76 mm) on center between each major corrugation.
 - c. Form one outboard corrugation as overlapping corrugation.
 - d. Form opposite outboard corrugation as underneath corrugation with full return leg to support side lap and a continuous anti-siphon drain channel.
 - e. Factory cut to required length.
 - f. Factory miter cut gable ends.
 - g. Material and Finish: As shown on Erection Drawings, except as specified herein.
 - h. Fasteners: Color coated No. 10 piercing screws with 1/4 inch (6 mm) hex head pre-assembled to 1/2 inch (13 mm) O.D. dome seal or bond seal galvanized steel and EPDM washers.
- B. Siding: Moderra mortarless masonry as manufactured by Moderra Concrete Siding, a division of Alliance Concrete Concepts, Inc. (www.moderra.com.)
 - 1. Standard Unit: Exterior dimension 0.88 square feet and a minimum of 2.25 inches thickness.
 - 2. Adjustor Unit: Exterior dimension 0.88 square feet and a minimum of 2.25 inches thickness.
 - 3. Corner Unit: Exterior dimension is 0.88 square feet and a minimum of 2.25 inches thickness.
 - 4. Sill Unit: Exterior dimension is 0.44 square feet and a minimum of 3.5 inches thickness.
 - 5. Color: As selected from manufacturer's standard colors (http://moderra.com/newcolors.asp?cat=All).
 - 6. Face Surface: Fractured rock face with a scored design.
 - 7. Face Surface: STRI pattern with a scored design.
 - 8. Performance: ASTM C90, ASTM C140/C140M, ASTM C145 with compressive strength of 4,000 psi, absorption 6 percent, unit height variance plus or minus 1/32 inch.
 - 9. Sill Attachment: Adhesive meeting the manufacturer's specifications.
 - 10. Base Pad Material:
 - a. Steel Angle: Minimum of 2 inches wide and 3 inches high and 1/4 inch thick, as engineered.
 - b. Brick Ledge: Traditional brick ledge, level.
- C. Siding: Acrylit translucent wall panels as manufactured by Glasteel, a division of Stabilit America Inc. (www.glasteel.com).
 - 1. Type: Corrugated to match wall panel profile, 36 inch coverage.
 - 2. Material: Acrylic and polyester resins with gel coat UV protective layer, ASTM D3841, minimum 6 ounces per square foot, 65 percent visible light transmission.
- D. Siding: fiber cement lap siding
 - 1. Material: Composed of cement, sand, cellulose fibers, water and selected additives that have been autoclaved (cured with pressurized steam).

- 2. Style: Horizontal Lap Siding: 5/16 inch thick, Widths: 5.25 feet to12 feet; Lengths: 12 feet; Exposures: 4 inches to 10.75 inches.
- 3. Style: I Panel Siding: 5/16 inch thick, Widths: 4 feet; Lengths: 8 feet, 9 feet, 10 feet; Traditional 8 inch on center reverse batten board; Classic Cedar finish; Fiesta Stucco classic tudor finish.
- 4. Style: MultiShake Shakes: 1/4 inch thick; 16 feet wide; 4 feet long; 6 inch exposure; staggered edge or provenzal edge.
- Factory Finish: Primed and two coat paint system covered by 25 year warranty.
 a. Color: As selected by the Architect.
- 6. Field Finish: Factory Primed, ready for field painting.
- E. Siding: As selected by Architect.
- F. Siding Accessories:
 - 1. Wall Trim and Flashings: Manufacturer's standard wall trim and flashings.
 - 2. Louvers: Manufacturer's standard sheet metal unit with 1/2 inch (13 mm) hardware cloth screen, pre-finished enamel in color selected from Lester standard colors, 18 x 24 inch (457 x 610 mm) size.
 - 3. Closure Strips: Closed cell, 2 pcf (32 kg/m3) density polyethylene foam, premolded to match configuration of panels.
 - 4. Material and Finish: As shown on Erection Drawings, except as specified herein.

2.08 INSULATION

- A. Blanket Insulation: ASTM C665, Type I, Class A, Unfaced Fiberglass Blanket.
 - 1. Thermal Resistance: R-19 (R-3.34) and R-30 (R-5.28)
 - 2. Physical Properties:
 - a. Flame Spread, ASTM E84: Less than 25.
 - b. Smoke Developed, ASTM E84: Less than 50.
- B. Blanket Insulation: ASTM C665, Type II, Class C, Kraft Faced Fiberglass Blanket.
 - 1. Thermal Resistance: R-19 (R-3.34) and R-24 (R-4.22)
 - 2. Physical Properties:
 - a. Water Vapor Transmission, ASTM E96/E96M, 1.00 Perm (57.45 ng/(Pa*s*m^2) or less.
- C. Blanket Insulation: ASTM C991, Type II, Preformed Poly-Scrim-Kraft-Faced Fiberglass Blanket, located between framing and exterior sheathing:
 - 1. Thermal Resistance: R-6 (R-1.06).
 - 2. Facing: 0.0015 inch white polypropylene film, fiberglass scrim reinforcement, and 12 lb. craft paper. 3 mil cross laminated high density polyethylene.
 - 3. Physical Properties:
 - a. Flame Spread, ASTM E84: Less than 25
 - b. Smoke Developed, ASTM E84: Less than 50
 - c. Water Vapor Transmission, ASTM E96/E96M: 0.02 Perms (1.15 ng/(Pa*s*m^2).
 - d. Light Reflectivity, ASTM C533, illuminant D-6500: 87 percent.

2.09 INTERIOR FINISH - WALLS AND CEILINGS

- A. Steel Panel:
 - Type: Uni-Rib panel 30 Gauge, ASTM A653/A653M, Structural Quality, Grade 80 (550) (formerly Grade E), galvanized steel with G40 (Z120) zinc coating both sides, Triple Spot Test. Color: Liner White.
 - 2. Type: Uni-Rib Acoustical panel perforated with 3/32 inch diameter holes to allow sound dissipation. The holes are arranged in a 1/4 inch on-center staggered pattern. 30 gauge,

ASTM A653/A653M steel, Structural Quality, Grade 80 (550) (formerly Grade E), with G40 (Z120) zinc coating both sides, Triple Spot Test. Colors: Lester Liner White.

- 3. Type: Uni-Rib with adhered DripStop Condensation Control membrane: UL 723 approved for flame spread and smoke generation; 20 year adhesion warranty.
- B. Fiber Reinforced Plastic (FRP):
 - 1. FRP Thickness: 0.060 inch.
 - 2. FRP Laminated to Substrate: 5/8 inch sanded plywood.
 - 3. Seams: Plastic Batten System.
 - 4. Color: White.
- C. High-Density Polypropylene (HDPE):
 - 1. HDPE Thickness: 0.050 inches.
 - 2. HDPE Laminated to Substrate: 5/8 inch sanded plywood.
 - 3. Seams: Plastic Batten System
 - 4. Color: White.
- D. Vinyl Panels:
 - 1. Type: 16 inches wide, 10 mm thickness, corrugated, smooth seamless, tongue and groove, concealed fastener, vinyl panel. High gloss bright white, UV protected, (class A fire rating) sanitary panel system.
 - 2. Color: White.
- E. Interior Finish Type: As selected by Architect.

2.10 PERSONNEL DOORS

- A. Steel Frame, Steel Clad, Hinged Doors: Commercial Series by AJ Manufacturing, HYPERLINK "http://www.ajdoor.com." (www.ajdoor.com).
 - 1. Non-Thermally Broken Doors: Series 5100 doors, frames and hardware.
 - a. Frame: 16 gauge, G60 galvanized, 50 ksi.
 - 1) Sill: Solid extruded aluminum, 0.062 inch minimum wall thickness, 1/2 inch low-profile, ADA compliant sill.
 - 2) Head: Solid extruded aluminum, 0.062 inch minimum wall thickness, field installed snap-in parting stop.
 - 3) Overall Frame Depth: 3-1/2 inches,.
 - 4) Weatherstripping: Field-installed, frame-mounted, dual seal, bulb and leaf, extruded Santoprene sides and head; bulb and wand Alcryn sweep bottom rail.
 - b. Door Panel: 1-3/4 inches thick, pressure injected, 2.2 pcf polyurethane foam insulation, R-12, 24 gauge, G60 galvanized steel skin, both sides, rolled edges wrap into the stiles and rails. No perimeter frame.
 - 1) Rails and Stiles: Extruded aluminum rails and stiles, painted to match skins.
 - 2) Reinforcing: Extruded aluminum reinforcing blocks at lock, deadbolt, panic hardware and closer locations.
 - 3) Hardware Preparation: 2-3/4 inch backset with 2-1/8 inch diameter lock bore hole.
 - 4) Finish: Factory-painted siliconized polyester.(a) Color: As selected by the Architect.
 - 2. Thermally Broken Doors: Series 7100 doors, frames and hardware.
 - a. Frame: 16 gauge, G60 galvanized, 50 ksi.
 - 1) Sill: Thermally-broken extruded aluminum, 0.062 inch minimum wall thickness, 1/2 inch low-profile, ADA compliant sill.
 - 2) Head: Thermally-broken extruded aluminum, 0.062 inch minimum wall thickness, field installed snap-in parting stop.
 - 3) Overall Frame Depth: 3-1/2 inches.

- 4) Weatherstripping: Field-installed, frame-mounted, dual seal, bulb and leaf, extruded Santoprene sides and head; bulb and wand Alcryn sweep bottom rail.
- b. Door Panel: 1-3/4 inches thick, pressure injected, 2.2 pcf polyurethane foam insulation, R-12. 24 gauge, G60 galvanized steel skin, both sides, rolled edges wrap into the stiles and rails. No perimeter frame.
 - 1) Rails and Stiles: Pultruded fiberglass rails and tiles, painted to match skins.
 - 2) Reinforcing: High density molded urethane reinforcing blocks at lock, deadbolt, panic hardware and closer locations.
 - 3) Hardware Preparation: 2-3/4 inch backset with 2-1/8 inch diameter lock bore hole.
 - 4) Finish: Factory-painted siliconized polyester.
 - (a) Color: As selected by the Architect.
- 3. Glazing:
 - a. Glass: Float glass, ASTM C1036, Quality 1.
 - b. Glass: Tempered glass, ASTM C1048.
 - c. Glass: As selected by Architect.
 - d. Door Lites: 22 by 64 inch lite, 3/4 inch double pane insulating glass with 1/2 inch air filled space.
 - 1) Grid: 3x5.
 - (a) Grid Color: As selected by the Architect.
- 4. Grade 2 Commercial Hardware:
 - a. Lever-Lever Lockset: Entry, privacy and passage models as applicable, satin chrome finish, 1/2 inch stainless steel latch bolt, anti-lockout feature.
 - b. Deadbolt: Satin chrome finish, 1 inch hardened throwbolt, free spinning cylinder collar, double ball-bearing anti-drill design.
 - c. Hinges: Three 4x4 stainless steel ball-bearing hinges with tamperproof pins.
- 5. Installation Accessories:
 - a. Corrugated Steel Siding:
 - 1) Steel J flashing at head, standard color.
 - 2) Steel C flashing at jambs, standard color.
 - 3) Sealant, Manus 75-A caulk, color to match siding and as selected by the Architect.
 - b. Vertical or Horizontal Wood or Vinyl Siding:
 - 1) Flexible bituminous self-adhesive flashing at head and jambs, 6 inches wide.
 - 2) Sealant, Manus 75-AM caulk, clear.
- B. Steel Frame, Steel Clad, Hinged Doors: Expi-Door Systems, Inc.,

"http://www.bayindustries.com." (www.bayindustries.com).

- 1. Non-Thermally Broken Doors: Series 500 doors, frames and hardware.
 - a. Frame: 16 gauge galvanized A60 with welded corners; 14 gauge galvanized A60 top and bottom channels, 7 gauge hinge reinforcement.
 - 1) Threshold: 5-3/4 inch full aluminum, ADA compliant.
 - b. Door Panel: 20 gauge galvanized smooth skin, polystyrene core, beveled edge with interlocking seam.
 - c. Weather Protection: Self-adhesive weather seal and U concealed sweep.
 - d. Hardware: Schlage grade 2 lever lock and 3 stainless steel ball bearing hinges with tamperproof pins.
- 2. Finish: Factory-painted siliconized polyester.
- a. Color: As selected by the Architect.
- 3. Installation Accessories:
 - a. Corrugated Steel Siding:
 - 1) Steel J flashing at head, standard color.
 - 2) Steel C flashing at jambs, standard color.
 - 3) Sealant, Manus 75-A caulk, color to match siding and as selected by the Architect.

- b. Vertical or Horizontal Wood or Vinyl Siding:
 - 1) Flexible bituminous self-adhesive flashing at head and jambs, 6 inches wide.
 - 2) Sealant, Manus 75-AM caulk, clear.

2.11 JOINT SEALANT MATERIAL

- A. Sealant: Manus 75-A for applications that will not be painted, contains no solvents or isocyanates, non-yellowing.
 - 1. Color: Clear, White, Bronze, and as selected by the Architect.
- B. Sealant: Manus 75-AM for applications that will be painted, contains no solvents or isocyanates, non-yellowing. Use white or bronze color for nearest match to adjacent substrate.
 1. Color: Clear, White, Bronze, and as selected by the Architect.
- C. Tape Sealant: Manus-Bond 64-A Polysul Grip tape or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are acceptable for erection/installation of pre-engineered wood building system.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory conditions.
- C. Commencement of work by erector/installer is acceptance of site conditions.

3.02 ERECTION- STRUCTURAL FRAMING

- A. Erect in accordance with manufacturer's instructions and approved shop drawings.
- B. Provide temporary erection and wind load bracing to maintain structure plumb and in alignment until installation of permanent bracing and/or roofing and wall coverings are completed.
- C. Do not field cut or alter structural members without approval of Architect and manufacturer.

3.03 INSTALLATION

- A. Erect building per manufacturer's instructions and sequencing.
- B. Metal Roofing:
 - 1. General: Install in accordance with manufacturer's instructions. Secure to structural framing aligned, level and plumb. Space fasteners as shown on Erection Drawings.
 - 2. Sidelap: Minimum one full corrugation.
 - 3. Endlap: 8 inches (200 mm) for slopes 4 in 12 to 5 in 12. Secure together over and to structural members.
 - 4. Endlap: 12 inches (300 mm) for slopes 2 in 12 to 4 in 12. Secure together over and to structural members.
 - 5. Endlap: 6 inches (150 mm) for slopes greater than 5 in 12. Secure together over and to structural members.
 - 6. Special detailing is required for slopes less than 2 in 12. Refer to construction documents.
 - 7. Accessories: Install as shown on Erection Drawings.
- C. Deck at Shingle Roofing: Comply with applicable recommendations "APA Design/Construction Guide Residential & Commercial" using specified fasteners.

PART 1

1.01 GENERAL

A. Drawings and General Provisions of the Agreement, including General Conditions and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

- A. Section includes: Machine room-less electric traction passenger elevator(s) as shown on Contract Drawings and specified herein. Elevator work includes:
 - 1. Standard pre-engineered MRL Traction passenger elevator.
 - 2. Elevator car enclosures, hoistway entrances and signal equipment.
 - 3. MRL Equipment
 - 4. Operation and control systems.
 - 5. Accessibility provisions for physically disabled persons.
 - 6. Equipment, machines, controls, systems, and devices as required for safety operating the specified elevator(s) at their rated speed and capacity.
 - 7. Materials and accessories as required to complete the elevator installation.
- B. Products supplied but not installed by Elevator supplier. These items are to be installed by the General Contractor.
 - 1. Hoist Beam and Safety Tube.
 - 2. Pit Ladder.
 - 3. Inserts mounted in CMU and/or concrete walls for rail attachments.
- C. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 03 Concrete: Installing inserts, sleeves, and anchors in concrete.
 - 2. Division 04 Masonry: Installing inserts, sleeves and anchors in masonry and coordinating wall openings for wiring ducts in masonry and for grouting elevator entrance frames installed in masonry openings.
 - 3. Division 05 Metals:
 - a. Providing steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Elevator pit sump frame and grate.
 - c. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
 - 4. Division 07 Cementitious Waterproofing: Waterproofing elevator pit walls.
 - 5. Division 09 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
 - 6. Division 22 Plumbing:
 - a. Sump pump and oil interceptor.
 - 7. Division 23 Heating, Ventilation and Air Conditioning.
 - a. Heating and ventilating hoistways and/or control room.
 - 8. Division 26 Electrical.
 - a. Providing electrical service to elevators, including fused disconnect switches where permitted. (Note: fused disconnect switch to be provided as part of elevator manufacture product, see Section 2.11 Miscellaneous elevator components for further details.)
 - b. Emergency power supply, transfer switch and auxiliary contacts.
 - c. Convenience outlets and illumination in hoistway and pit.
 - d. Telephone System wiring for ADAAG Required Emergency Communications Systems.
 - 9. Division 28 Electronic Safety and Security:
 - a. Heat and smoke sensing devices.

1.03 PERFORMANCE REQUIREMENTS

- A. Car Performance
 - 1. Car Speed \pm 5% of contract speed under any loading condition or direction of travel.
 - 2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- B. System Performance
 - 1. Vertical Vibration (maximum): ISO 18738/ISO 8041 system pk-pk 15 mg.
 - 2. Horizontal Vibration (maximum): ISO 18738/ISO 8041 system pk-pk 12 mg.
 - 3. Jerk Rate (maximum): 1 m/s³.
 - 4. Acceleration (maximum): 0.4 m/s².
 - 5. In Car Noise: 55 dB(A) Maximum.
 - 6. Leveling Accuracy: ±0.2 inches.
 - 7. Starts per hour (maximum): 180.
- 1.04 SUBMITTALS
 - A. Product Data: The elevator contractor shall provide standard cab, entrance, and signal fixture data to describe products for approval.
 - B. Shop Drawings:
 - 1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections, and details of assembly, erection, anchorage, and equipment location.
 - 2. Show clear inside hoistway and pit dimensions.
 - 3. Indicate elevator system capacities, sizes, performances, safety features, finishes, and other pertinent information.
 - 4. Show floors served, travel distances, maximum loads imposed on the guiding structure at points of support and all similar considerations of the elevator work.
 - 5. Indicate electrical power requirements and branch circuit protection device recommendations.
 - C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
 - D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
 - E. Metal Finishes: Upon request, provide standard metal samples.
 - F. Operation and maintenance data.
 - 1. Manufacturer's standard maintenance and operation manual including:
 - a. Owner's manuals and wiring diagrams.
 - b. Parts list, with recommended parts inventory.
 - G. Diagnostic Tools
 - 1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed.
 - 2. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator

Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor.

- 3. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the competed project During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner.
- 4. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor.
- 5. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum 15-years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
 - 1. The manufacturer of machines, controllers, signal fixtures, door operator cabs, entrances, and all other major parts of elevator operation equipment.
 - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
 - 2. The manufacturer shall have a documented, on-going quality assurance program.
 - 3. ISO-9001: Latest Edition Manufacture Certified.
 - 4. ISO-14001: Latest Edition Environmental Management System Certified.
- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15-years of satisfactory experience installing elevators equal in character and performance to the project elevator(s).
- C. Regulatory Requirements:
 - 1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
 - 2. NFPA 70 National Electrical Code.
 - 3. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
 - 4. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
 - 5. Section 407 in ICC A117.1I, when required by local authorities.
 - Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1-1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).
 - 7. Inspection and testing:
 - a. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 - b. Arrange for inspections and make required tests.
 - c. Inspection and Acceptance Certificates and Operating Permits: Deliver to the Owner upon completion and acceptance of elevator work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.07 PROJECT CONDITIONS

A. Temporary 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 Owner unless agreed upon by Elevator Contractor, General Contractor, and Owner with signed temporary agreement.

1.08 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.09 MAINTENANCE

- A. Furnish maintenance and call back service for a period of 12 months for elevator after Substantial Completion, during normal working hours excluding callbacks.
 - 1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
 - 2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
 - 3. Manufacturer shall have a service office and full time service personnel within a 75 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
 - 1. Basis of Design: MonoSpace® 300 traction elevators by KONE, Inc. (www.kone.com).
 - 2. Architect approved equivalent machine room-less products: manufacturer with minimum 15 years' experience in manufacturing, installing, and servicing elevators of the type required for the project.
 - a. Elevator substitution must fit within the designed hoistway dimensions, comply with all dimensional requirements and all mechanical and electrical provided for the basis of design.

2.02 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer-based control system to perform all functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non- volatile memory module.

- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location: Locate controller{s} in the front wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permanent power in hoist way at top landing. A separate control space should not be required.

2.03 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Polyurethane buffer.
- 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 magnets and proximity switches.
- F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.04 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: Extruded Aluminum.
 - 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - 4. Entrance Finish: Brushed Stainless Steel.
 - 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.05 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Car Safeties: Device will be provided and mounted under the car platform, securely bolted to the Car Frame. The safety will be actuated by a centrifugal governor mounted at the top of the hoistway. The Safety is designed to operate in case the car attains excessive descending speed.
- C. Platform: Platform shall be all steel construction.
- D. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- E. Car Wall Finish:
 - 1. Side Walls: Raised Laminate Panels, As selected by Architect from manufacturer's standard colors.

- 2. Rear Wall: Raised Laminate Panels, As selected by Architect from manufacturer's standard colors.
- 3. Car front, Door and Skirting: Brushed Stainless Steel
- 4. Ceiling: CL94 Rectangular, LED light panel
- 5. Handrails: Brushed Stainless Steel
 - a. Rails to be located on sides and rear of car enclosure.
- 6. Sills: Aluminum extruded.
- F. Cab Wall Protection: Pads to be included.
- G. Flooring: By General Contractor (Not to exceed 3lb/sq.ft. and 1/2" finished depth.)
- H. Emergency Car Signals
 - Emergency Siren: Siren mounted on top of cab 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.
 - 2. Emergency Car Lighting: Provide emergency power unit employing a 12- volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- I. Ventilation: Manufacturer's standard cab fan.

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation. Fixture finish to be Brushed Stainless Steel.
 - 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. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel: Brushed Stainless Steel.
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Call Cancel Button.
- B. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a Brushed Stainless Steel finish.
 - 1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture.
- C. 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.

2.07 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

- 1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 - a. Zoned Car Parking.
 - b. Relative System Response Dispatching.
- B. Standard Operating Features to include:
 - 1. Full Collective Operation.
 - 2. Fan and Light Control.
 - 3. Load Weighing Bypass.
 - 4. Ascending Car Uncontrolled Movement Protection.
 - 5. Top of Car Inspection Station.
- C. Additional Operating Features to include:
 - 1. Independent Service.
 - 2. Hoistway Access Top Landing.
 - 3. Car Wall Protection Pads.
 - 4. Standby Power.
- D. Elevator Control System for Inspections and Emergency
 - 1. Provide devices within controller to run the elevator in inspection operation.
 - 2. Provide devices on car top to run the elevator in inspection operation.
 - 3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
 - 4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
 - 5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
 - 6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
 - 7. Provide the means for the control to reset elevator earthquake operation.

2.08 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided 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. The door operator shall be arranged so that, 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. Emergency devices and keys for opening doors from the landing shall be provided 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. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed 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. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, 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. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.03 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 Contract Drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
- C. Supply an ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- D. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- E. 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.
- F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation, or vibration.
- G. 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.

- H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
- I. After installation, the hoist beam must be relocated to the front or rear of the hoistway and must not be left directly above the car top.
- J. Lubricate operating parts of system, where recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

- A. Acceptance Testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times test are to be performed on the elevator.

3.05 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.06 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; It shall not be cleaned with bleach-based cleansers.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
- C. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.07 PROTECTION

A. 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.

3.08 DEMONSTRATION

- A. Instruct Owner's personnel in proper use, operations, 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.
- 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.

3.09 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.

3.10 ELEVATOR SCHEDULE

- A. Elevator Quantity: 1 (one).
 - 1. Elevator Model: MonoSpace® 300 gearless traction elevator.
 - 2. Elevator Type: Electric Machine Room-Less, Passenger.
 - 3. Rated Capacity: 3,000 lbs.
 - 4. Rated Speed: 150 FPM
 - 5. Equipment Control: KCM831.
 - 6. Operation: Simplex.
 - 7. Drive: Non Regenerative
 - 8. Travel: 12' 0".
 - 9. Landings: 2 (two) total.
 - 10. Openings:
 - a. Front: 2
 - b. Rear: 0
 - 11. Platform: 6'-7-5/16" wide x 5' 8-1/8" deep.
 - 12. Cab Height: 7'-6" standard.
 - 13. Clear height under suspended ceiling: 7'-4".
 - 14. Hoistway Entrance Size: 3'-6" wide x 7'-0" high.
 - 15. Door Type: Right Opening.
 - 16. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
 - 17. Machine Location: Inside the hoistway mounted on car guide rail.
 - 18. Control Space Location: Integrated Control
 - 19. Seismic Requirements: Zone 1.
 - 20. Hoistway Dimensions: 8'-6" wide x 6'-4" deep.
 - 21. Pit Depth: 5'-0".
 - 22. Special Operations:
 - a. Emergency Battery Drive.

1.01 SECTION INCLUDES

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.
- B. Product Data: Catalog sheets, specifications and installation instructions for each item specified except fasteners.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with the applicable requirements of the ASME B31 Piping Codes.
 - Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.
 - 3. Materials for use in Sprinkler Systems and Standpipe and Hose Systems shall comply with the requirements of NFPA 13 and NFPA 14 as applicable.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Do not hang or support one pipe from another or from ductwork.1. Do not bend threaded rod.
- B. Support all insulated horizontal piping conveying fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.
- C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.
 - 1. For Steel Pipe:

| PIPE SIZE (Inches) | MAXIMUM SPACING (Feet) |
|--------------------|------------------------|
| 1 and under | 8 |
| 1-1/4 and 1-1/2 | 9 |
| 2 | 10 |
| 2-1/2 and up | 12 |
| | |

1. For Grooved End Steel Pipe:

| PIPE SIZE (Inches) | MAXIMUM SPACING (Feet) |
|--------------------|------------------------|
| 1-1/2 and under | 7 |
| 2 through 4 | 10 |
| 5 and over | 12 |
| | |

- 1. No pipe length shall be left unsupported between any two coupling joints.
- 2. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
- 3. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
- 4. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
- 5. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

| PIPE OR TUBING SIZE (Inches) | SINGLE ROD HANGER SIZE (Inches) | | | HANGER SIZE hes) |
|------------------------------------|------------------------------------|--------|------|---------------------|
| | PIPE | TUBING | PIPE | TUBING |
| 1/2 to 2 | 3/8 | 1/4 | 3/8 | 1/4 |
| 2-1/2 and 3 | 1/2 | 3/8 | 3/8 | 1/4 |
| 4 and 5 | 5/8 | 1/2 | 1/2 | 3/8 |
| 6 | 3/4 | 1/2 | 5/8 | 1/2 |
| 8, 10 and 12 | 7/8 | 5/8 | 3/4 | 5/8 |
| | | | | |

D. Minimum Hanger Rod Size: Increase hanger rod size as required to meet requirements of seismic restraint system.

- 1. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.
- 2. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each rod, two at upper hanger attachment and two at hanger.
- E. Vertical Piping:
 - 1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.

- Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
- F. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

3.02 UPPER HANGER ATTACHMENTS

- A. General:
 - 1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
 - 2. Do not attach hangers to steel decks that are not to receive concrete fill.
 - 3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
 - 4. Do not use flat bars or bent rods as upper hanger attachments.
- B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.
 - 1. Do not use drive-on beam clamps.
 - 2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
 - 3. Do not drill holes in main structural steel members.
 - 4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer's recommended limits.
- C. Attachment to Concrete Filled Steel Decks:
 - 1. New Construction: Install metal deck ceiling bolts.
 - 2. Existing Construction: Install welding studs (except at roof decks). Do not support a load in excess of 250 lbs from any single welded stud.
 - 3. Do not attach hangers to decks less than 2-1/2 inches thick.
- D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.
- E. Attachment to Existing Cast-In-Place Concrete:
 - 1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.
 - 2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.
- F. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.
- G. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks:
 - 1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.
 - 2. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.
- H. Attachment to Waffle Type Concrete Decks:
 - 1. New Construction: Install cast-in-place inserts.
 - 2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

- I. Attachment to Precast Concrete Tee Construction:
 - 1. New Construction: Tee hanger inserts between adjacent flanges, except at roof deck without concrete fill.
 - 2. Existing Construction: Dual unit expansion shields in webs of tees. Install shields as high as possible in the webs.
 - a. Exercise extreme care in the field drilling of holes to avoid damage to reinforcing.
 - b. Do not use powder driven fasteners.
- J. Attachment to Wood Construction: Secure hangers to the sides (only) of wood members, by means of malleable iron side beam connectors, or malleable iron or steel side beam brackets. Do not secure hanger attachments to nailing strips resting on top of steel beams.
 - 1. Secure side beam connectors to wood members with two No. 18 x 1-1/2 inch long wood screws, or two No. 16 x 1-1/2 inch long drive screws. Do not support piping over 1-1/2 inches in size from side beam connectors. Do not hammer in wood screws.
 - 2. Secure side beam brackets to wood members with steel bolts or lag screws. Do not use lag screws in wooden members having a nominal thickness (beam face) less than 2 inches in size. Install bolts or lag screws, in the sides of a timber or a joist, at the mid-point or above, not less than 2-1/2 inches from the lower edge when supporting branch lines and not less than 3 inches from the lower edge when supporting mains. Install heavy gage steel washers under all nuts.
 - 3. Secure side beam brackets to wooden beams or joists, with lag screws or bolts of size as follows:

| PIPE SIZE (Inches) | LAG SCREW SIZE (Inches) | BOLT DIAMETER (Inches) |
|--------------------|-------------------------|------------------------|
| 2 and under | 3/8 diameter x 1-3/4 | 3/8 |
| 2-1/2 and 3 | 1/2 diameter x 2 | 1/2 |
| 4 and 5 | Use Bolt | 5/8 |
| | | |

- 1. Do not support piping larger than 3 inches with lag screws. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.
- 2. The minimum width of the lower face of wood beams or joints in which lag screws of size as specified may be used is as follows:

| LAG SCREW DIAMETER (Inches) | NOMINAL WIDTH OF BEAM FACE (Inches) |
|-----------------------------|-------------------------------------|
| 3/8 | 2 |
| 1/2 | 3 |
| | |

1. Do not secure hanger attachment to the diagonals or vertical members of the trusses.

3.03 PIPING IN TUNNELS

A. Support piping in tunnels on adjustable stanchions, fabricated in accordance with the details on the Drawings, unless otherwise indicated. Install, secure and be responsible for the proper locations of all cast-in-place inserts and stanchion supports, in ample time so as not to delay construction Work. Secure tops of stanchions to overhead construction, as required and approved.

3.04 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.05 PIPE INSULATION SHIELDS

A. Unless otherwise specified, install a pipe insulation shield, at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Through Penetration Firestops: Section 078400.
- B. Sealants: Section 079200.

1.03 REFERENCES

- A. NFPA 13 Standard for the Installation of Sprinkler Systems.
- B. NFPA 14 Standard for the Installation of Standpipe and Hose Systems.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
 - 2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.
- PART 2 PRODUCTS
- PART 3 EXECUTION

3.01 INSTALLATION

- A. Install piping at approximate locations indicated, and at maximum height.
- B. Install piping clear of door swings, and above sash heads.
- C. Make allowances for expansion and contraction.
- D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.
- E. Install horizontal piping with a constant pitch, and without sags or humps.
- F. Install vertical piping plumb.
- G. Use fittings for offsets and direction changes.
- H. Cut pipe and tubing ends square; ream before joining.
- I. Threading: Use American Standard Taper Pipe Thread Dies.

3.02 FIRE SPRINKLER AND FIRE STANDPIPE PIPING SYSTEM

A. Install piping to be completely drainable.

3.03 PIPE JOINT MAKE-UP

- A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.
- B. Flanged Pipe Joint:
 - 1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.
 - 2. Provide a gasket for each joint.
 - 3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.
- C. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer's printed installation instructions.
- D. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.
 1. Cut grooved end piping is not acceptable.
- E. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.
- F. Dissimilar Pipe Joint:
 - 1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and calk into the cast iron bell.
 - 2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
 - 3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.
 - 4. Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.

3.04 PIPING PENETRATIONS

A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

| | CONSTRUCTION | SLEEVE TYPE | |
|-----|---|---------------|-----|
| 1. | Frame construction. | None Required | |
| 2. | Foundation walls. | A* | |
| 3. | Non-waterproof interior walls. | B* | |
| 4. | Non-waterproof interior floors on metal decks. | D* | |
| 5. | Non-waterproof interior floors not on metal decks | B* | |
| 6. | Floors not on grade having a floor drain. | A | |
| 7. | Floors over mechanical equipment, steam service, machine, and boiler rooms. | A A | |
| 8. | Floors finished or to be finished with latex composition or terrazzo, and on metal decks. | D* | |
| 9. | Floors finished or to be finished with latex composition or terrazzo, and not on metal decks. | A | |
| 10 | D. Earth supported concrete floors. | None Required | |
| 02 | 211300 - | 2 Is | sue |
| 000 | willo Eiro District | | |

17. Waterproof walls.

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

- Diameter of Sleeves and Core Drilled Holes: B.
 - Unless otherwise specified, size holes thru floors and walls in accordance with the through 1. penetration fire stopping system being used.
 - Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, 2. and exterior concrete slabs in accordance with the following:
 - a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
 - Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than b. outside diameter of insulation, unless otherwise specified.
 - Mechanical Modular Seals: Size holes in accordance with the manufacturer's C. recommendations.
 - Size holes for sprinkler and fire standpipe piping in accordance with NFPA 13. 3.
- C. Length of Sleeves (except as shown otherwise on Drawings):
 - Walls and Partitions: Equal in length to total finished thickness of wall or partition. 1.
 - Floors. Finished: Equal in length to total finished thickness of floor and extending 1/2 inch 2. above the finished floor level, except as follows:
 - In furred spaces at exterior walls, extend sleeve one inch above the finished floor a. level.
 - Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch 3. above the concrete slab.
 - Roofs: Equal in length to the total thickness of roof construction, including insulation and 4. roofing materials, and extending one inch above the finished roof level.
- D. Packing of Sleeves and Core Drilled Holes:
 - 1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.
 - Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors 2. with oakum to within 1/2 inch of each wall face, and finish both sides with Type 1C (one part) sealant. See Section 079200.
 - a. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
 - Pack sleeves in exterior concrete slabs with oakum to full depth, and within 1/2 inch of top 3. of sleeve and finish the remainder with sealant. See Section 079200.
 - a. Sealant Types:
 - b. Piping Conveying Materials up to 140 degrees F other than Motor Fuel Dispensing System Piping: Type 1C (one part).
 - С Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
- E. Weld metal collars of Type C and D sleeves to the upper surface of the metal deck. Seal voids under the metal collar as recommended by the manufacturer of the metal deck.

3.05 FLOOR, WALL AND CEILING PLATES

- A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:
 - 1. Piping 2 Inch Size and Smaller In Finished Spaces:
 - 2. Solid Type: Chrome plated cast brass construction with set screw.
 - 3. Split Type: Chrome plated stamped steel construction with set screw.
 - Piping over 2 inch size In Finished Spaces, and Piping in Unfinished Spaces:
 a. Solid Type: Galvanized cast iron construction with set screw.
 - 5. Split Type: Chrome plated stamped steel construction with set screw.
 - 6. Piping in Unfinished Spaces (Including Exterior Concrete Slabs): Solid type, galvanized, cast iron or malleable iron construction.
 - 7. Fasten plates with set screws.
 - 8. Plates are not required in pipe shafts or furred spaces.

3.06 PIPE AND FITTING SCHEDULE

- A. Where options are given, choose only one option for each piping service. No deviations from the selected option will be allowed.
- B. Fire Standpipe and Sprinkler:
 - 1. Option No. 1: Standard weight black steel pipe, with standard weight cast iron fittings, and threaded joints.
 - 2. Option No. 2: Standard weight black steel pipe, with roll grooved ends, grooved pipe fittings, and couplings.
- C. Sprinkler and Standpipe (Below Ground): Coated ductile iron water pipe and fittings, with mechanical or push-on joints.

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Painting: Section 099103.
- B. Backflow Preventers: Section 210524.
- C. Hangers and Supports: Section 210529.
- D. Sprinkler Piping: Section 211300.
- E. Motors and Motor Controllers: Section 260221.

1.03 REFERENCES

A. NFPA 13 - National Fire Protection Association Standard for the Installation of Sprinkler Systems.

1.04 SYSTEM DESCRIPTION

- A. Type of System:
 - 1. Wet System

1.05 SUBMITTALS

- A. Shop Drawings:
 - 1. Complete sprinkler system layout indicating the locations of sprinkler heads, devices, and accessories. Include separate details of special or not easily visualized piping arrangements and inspector's test valves and connections.
 - 2. Hydraulic calculations shall be complete and cross referenced to the appropriate drawing sheets.
- B. Product Data: Catalog sheets, specifications, and installation instructions. Indicate UL or FM approval for each product. Include the following additional information:
 - 1. Electrical Devices: Complete description of intended use, wiring diagrams, data plate information and, in the case of switching devices, whether normally on, or normally off. Include motor test data.
 - 2. Mechanical Devices: Complete description of intended use, including normal operating capacities and working pressures.
 - 3. Enclosures: Dimensions, materials, gages of metals; type of door hinges and locks, and methods of securing the enclosure members to the building construction.
 - 4. Hose Threads: Verify that hose threads on fire department connections match threads on equipment used by the local or servicing fire department.
- C. Quality Control Submittals:
 - 1. Design Data: The portions of the sprinkler system not sized on the Contract Drawings shall be sized in accordance with NFPA requirements for Hydraulically Designed Systems. Submit drawings and hydraulic calculations for approval.
 - 2. Certificates: As required under Quality Assurance Article.
 - 3. Installers Qualification Data:
 - a. Name of each person who will be performing the Work.
 - b. Upon request, furnish names and addresses of the required number of similar projects that each person has worked on which meet the experience criteria.

- D. Contract Closeout Submittals:
 - 1. Operation and Maintenance Data. Deliver 2 copies to the Owner's Representative:
 - a. Instruction manual describing the operation and maintenance of the system.
 - b. Parts list for each mechanical and electrical device.
 - c. Publication NFPA 25, Inspection, Testing, and Maintenance of Water Based Fire Protection Systems.

1.06 QUALITY ASSURANCE

- A. Qualifications: The persons employed to perform the Work of this Section and their supervisor shall be personally experienced in sprinkler work and shall have been regularly performing such work for a minimum of 5 years while in the employ of a company or companies engaged in the installation of sprinkler systems.
 - 1. Upon request, furnish to the Owner the names and addresses of five similar projects which the foregoing people have worked on during the past 3 years.
- B. Regulatory Requirements:
 - 1. Materials for the Work of this Section shall be Underwriter's Laboratories listed, and/or Factory Mutual approved.
- C. Certification: NFPA Contractor's Material and Test Certificate.

1.07 MAINTENANCE

- A. Spare Parts: Furnish the following items and deliver to the Owner for storage in spare sprinkler head cabinets:
 - 1. Spare sprinkler heads of each temperature range:
 - 2. One sprinkler head wrench to fit each type sprinkler head.
- PART 2 PRODUCTS
- PART 3 EXECUTION
- 3.01 INSTALLATION
 - Unless otherwise shown or specified, install the Work of this section in accordance with NFPA 13, and the item manufacturer's installation instructions.
 - B. Locking Valves:
 - 1. Lock gate valves in open position with chain looped through handwheel and around adjacent sprinkler pipe. Secure with padlock.
 - 2. Lock test outlet valve in closed position with padlock.
 - C. Spare Sprinkler Head Cabinet: Secure to building wall or other permanent structure in vicinity of main valve controlling sprinkler system, unless otherwise directed.
 - D. Signs: Install signs identifying the following:
 - 1. Valves: One for each size, type and function.
 - 2. Fire Department Connection
 - 3. Alarm Valves
 - 4. Hydraulically Designed System.

3.02 FIELD QUALITY CONTROL

A. Tests: Unless otherwise shown or specified, perform tests in accordance with NFPA 13.

- 1. Flushing: In addition to the requirements of the Standard, flush new piping before making final connection to existing systems and before performing hydrostatic test. Flush at rates of flow prescribed in the Contractor's Material and Test Certificate. After making final connections, flush entire system and assure that debris is removed from piping and there are no stoppages or obstructions in the system.
- 2. System Tests:
 - a. Test all new Work.
 - b. Notify the Owner's Representative when the Work of this Section is ready for testing.
 - c. Perform the tests when directed, and in the Owner's Representatives presence.

1.01 REFERENCES

- A. Underwriters Laboratories Inc.
- B. National Fire Protection Association Standard 17.

1.02 SYSTEM DESCRIPTION

- A. The dry chemical extinguishing system for the area shall operate as a manual and automatic fire detection, alarm and extinguishing system:
 - 1. Upon actuation of electric operated manual release devices the audible alarm device (vibrating bell) in the cafeteria/kitchen area sounds a continuous ringing signal, visual alarms illuminate, and the dry chemical agent delivery commences.
 - 2. Actuation of automatic initiating devices (thermostats) sounds the audible alarm device, illuminates visual alarms, and the dry chemical agent delivery commences.
 - 3. Dry chemical agent delivery is substantially completed in 30 seconds or less.
 - 4. Subsequent operation of other alarm initiating devices or faults in their circuits shall not interrupt the audible alarm signal.
 - 5. Selected dampers in ducts close.
 - 6. Electric operated gas valves close.
 - 7. Electric service to the electrically powered deep fat fryer is disconnected.
 - 8. Audible alarm device continues to sound until silenced manually at the alarm silencing unit.
 - 9. When dry chemical cylinders are recharged and the system is restored to normal condition:
 - a. The audible alarm device circuit is automatically reset by the alarm silencing unit.
 - b. Visual alarms automatically reset to normal condition.
 - c. Electric service to electrically powered deep fat fryer is automatically restored.
 - d. Dampers in ducts automatically reopen.
 - e. Electric operated gas valves do not reset automatically. Each valve must be individually, manually reset.
 - 10. Upon failure of normal electric service, electric operated gas valves close to prevent gas operated equipment from being used during the power outage.

1.03 DESIGN REQUIREMENTS

- A. The dry chemical extinguishing system shall be designed by the engineering staff of the Company producing the system or a fire protection company that specializes in the design of dry chemical extinguishing systems.
 - 1. Design approach based on NFPA-17 Dry Chemical Extinguishing Systems.
 - 2. Obtain preliminary design requirements including type of hazard, hazard material, hazard area volume, agent concentration and all other considerations required to produce an acceptable system design.
 - 3. Determine the total quantity of agent required, cylinder locations, manifold and piping routing, and the numbers and locations of nozzles correctly sized to produce the design concentration within the time specified.

1.04 SUBMITTALS

- A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.
- B. Submittals Package: Submit the shop drawings, product data and quality control submittals specified below at the same time as a package.

- 1. The shop drawings, product data, and quality control design data shall bear the seal of a professional engineer licensed to practice in the State of New York.
- C. Shop Drawings:
 - 1. Reproducible scale drawing of the complete system, indicating:
 - a. Location of piping and all major components.
 - b. Detail drawings of each major component with instructions for installation into the system.
 - c. Location, type and flow rate of each nozzle.
 - d. Location and size of all pipe and fittings.
 - e. Location and size of the cylinders.
 - 2. Composite wiring and/or schematic diagrams of the complete system as proposed to be installed (standard diagrams will not be accepted).
- D. Product Data:
 - 1. Catalog sheets, specifications, and installation instructions.
 - 2. Bill of materials.
 - 3. Detailed description of system operation. Format similar to SYSTEM DESCRIPTION.
 - 4. Name, address and telephone number of nearest fully equipped service organization, including data outlining available inspection and test programs.
- E. Quality Control Submittals:
 - 1. Design Data:
 - a. Calculations for the quantity of dry chemical agent required.
 - b. Design concentration.
 - c. Cylinder storage pressure and internal volume.
 - 2. Installers' Qualifications Data: Include the following for each person who will be performing the Work:
 - a. Name.
 - b. Employers name, business address and telephone number.
 - c. Name and addresses of the required number of similar projects worked on which meet the experience criteria.
 - 3. Company Field Advisor Data: Include:
 - a. Name, business address and telephone number of Company Field Advisor secured for the required services.
 - b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
 - c. Services and each product for which authorization is given by the Company, listed specifically for this project.
- F. Contract Closeout Submittals:
 - 1. System acceptance test report.
 - 2. Certificates:
 - a. Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the contract requirements and is operating properly.
 - 3. Operation and Maintenance Data:
 - a. Deliver 2 copies, covering the installed products, to the Owner's Representative. Include:
 - 1) Operation and maintenance data for each product.
 - 2) Complete point to point wiring diagrams of entire system as installed. Identify all conductors and show all terminations and splices. (Identification shall correspond to markers installed on each conductor.)
 - 3) Name, address, and telephone number of nearest fully equipped service organization.

1.05 QUALITY ASSURANCE

- A. Equipment Qualifications For Products Other Than Those Specified:
 - 1. At the time of submission provide written notice to the Owner of the intent to propose an "or equal" for products other than those specified. Make the "or equal" submission in a timely manner to allow the Owner sufficient time to review the proposed product, perform inspections and witness test demonstrations.
 - 2. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installation by the Owner's Representative and the Company Field Advisor.
 - a. Make arrangements with the owners of 2 installations (selected by the Owner) for inspection of the installations by the Owner's Representative. Also obtain the services of the Company Field Advisor for the proposed products to be present. Notify the Owner a minimum of 3 weeks prior to the availability of the installations for the inspection, and provide at least one alternative date for each inspection.
 - b. Only references from the actual owner or owner's representative (Security Supervisor, Maintenance Supervisor, etc.) will be accepted. References from dealers, system installers or others, who are not the actual owners of the proposed products, are not acceptable.
 - 1) Verify the accuracy of all references submitted prior to submission and certify in writing that the accuracy of the information has been confirmed.
 - 3. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.
 - a. Make arrangements with the test facility for the Owner's Representative to witness test demonstrations. Also obtain the services of the Company Field Advisor for the proposed product to be present at the test facility. Notify the Owner a minimum of 3 weeks prior to the availability of the test facility, and provide at least one alternative date for the testing.
 - 4. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements.
- B. Installers' Qualifications: The workmen and supervisors performing the Work of this section shall be personally experienced in dry chemical extinguishing systems and shall have been regularly employed by a company engaging in the installation of dry chemical systems for a minimum of five years and shall, upon request, furnish to the Owner the names and addresses of 5 similar projects which they have worked on during the last 3 years.
- C. Test Facility: The Company producing the system shall have test facilities available which can demonstrate that the proposed system meets contract requirements.
- D. Regulatory Requirements:
 - 1. Comply with applicable recommendations and requirements of Pamphlet No. 17 of the National Fire Protection Association.
 - 2. Materials and equipment shall have both Underwriters Laboratories and Factory Mutual approval.
 - 3. Dry Chemical Cylinders: Conform to Federal Department of Transportation Specifications.
- E. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 16 working hours for the following:
 - 1. Render advice regarding installation and final adjustment of the system.
 - 2. Witness final system test and then certify with an affidavit that the system is installed in accordance with the contract documents and is operating properly.

- 3. Train facility personnel on the operation and maintenance of the system (minimum of 2 one hour sessions).
- 4. Explain available service programs to facility supervisory personnel for their consideration.

1.06 MAINTENANCE

- A. Service Availability: A fully equipped service organization capable of guaranteeing response time within 8 hours to service calls shall be available 24 hours a day, 7 days a week to service the completed Work.
 - 1. An inspection and test program which incorporates an annual inspection and test procedure shall be available, including an interim inspection schedule and procedure to be performed by facility personnel between regular annual inspections (furnish inspection report forms).
- B. Spare Parts:
 - 1. 50 percent spare of each type fuse.
 - 2. 30 percent spare of each type lamp.
 - 3. 10 percent spare of each automatic initiating device (thermostats).
 - 4. 10 percent spare of each item requiring replacement for operation and routine maintenance of system (except dry chemical).

PART 2 PRODUCTS

- 2.01 COMPANIES
 - A. Safety First Products Corp., Elmsford, NY.
 - B. Water Kidde & Co., Wake Forest, NC.
- 2.02 TYPE OF SYSTEM
 - A. Total flooding and local application, main charge only, dry chemical extinguishing agent system.

2.03 COMPONENTS

- A. Pipe and Fittings:
 - 1. Schedule 40 threaded, galvanized steel pipe with standard weight, threaded malleable iron fittings.
 - 2. Special Pipe: Chromium plating is required on all exposed pipe in finished areas between the ceiling/walls and the hoods.
 - 3. Special Fittings: Distributor fittings and restrictor fittings of type and design as recommended by the manufacturer of the system.
- B. Dry Chemical Cylinder and Valve Assembly: Pressurized cylinder containing 25 or more pounds of dry chemical extinguishing material and fitted with a brass valve assembly complete with pressure gauge and wall mounting bracket.
- C. Primary Control Head: Automatic, Electrical:
 - 1. Manual release with breakable seal and operating instructions.
 - 2. Visual indicator to denote the released and set position of the system.
 - 3. Internally wired to actuate an alarm and shut down electrically operated devices.
- D. Tandem Control Head: Automatic, activated by the primary control head.

- E. Nozzles: Designed for the hazard to be protected. Types: Total flooding, local application, plenum and duct. Provide a blow-off type protective cap to protect nozzles installed in greasy atmospheres.
- F. Manual Release: Manually operated remote station, to electrically release the system. Consisting of an enclosure with a pull handle, DPST switch, and provided with a green light to indicate "power on" and the system in the set condition, and a red "system operated" light to denote that the system has been manually released. Kidde Part No. 893608 (120 V ac), mounted in cast back box for surface mounting.
- G. Gas Shut Off Valve: (Solenoid) Electrically operated, designed to shut down the gas supply to equipment upon the release of the system.
 - 1. Valve normally closed in the system released condition.
 - 2. Provide a relay box with a manual reset device with push button on the cover.
- H. Detectors: (Thermostats) Kidde Part No. 240835, 120 Volt, 450 degrees F.
- I. Enclosed Alarm Silencing Unit: Consisting of the following:
 - 1. One momentary push button switch.
 - 2. One relay with one set of normally closed contacts and one set of normally opened contacts.
 - 3. One pilot light (red).
 - 4. One NEMA-1 enclosure.
- J. Alarm Bell: 10 inch vibrating AC bell, with appropriate cast back box for surface mounting.
- K. Pipe Supports: Conform to ANSI B31.1, Section 6, Code for Power Piping. Provide pipe hangers, clamps and attachments best suited for the support of the piping system.
- L. Mounting Collars: Provide special mounting collars for alarm initiating devices, audible alarm devices, etc. when installed on surface raceways system.
- M. Terminal Strip Cabinets: Lockable, vandal resistant surface mounted boxes of 14 gage steel, size as recommended by manufacturer. Equip cabinets with barrier type, double screw terminals with identification strips, tags or labels for each wire. Paint cabinets red and stencil "DRY CHEMICAL EXTINGUISHING SYSTEM" thereon.
- N. Color: All equipment shall be fire alarm red.
- O. Wiring: Insulated conductors shall meet requirements of Section 260519 and the following:
 - 1. Alarm Initiating Circuits: Minimum No. 14 AWG type RHW, THW, XHHW, THWN or THHN.
 - 2. Audible Alarm Circuits: Minimum No. 12 AWG type RHW, THW, XHHW, THWN or THHN.
 - 3. Number of conductors and conductor size as recommended by the Company producing the system, except that conductor size shall not be less than previously specified.
 - 4. Special wiring as recommended by the Company producing the system.

2.04 ACCESSORIES

A. Include all accessories required to perform the functions summarized in SYSTEM DESCRIPTION and indicated on the drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this Section in accordance with NFPA-17 Standards, Manufacturer's printed installation instructions and approved shop drawings.
- B. Label all devices with proper instructions for operation.
- C. Install pipe hangers and supports in sufficient numbers and suitable spaced to adequately support the piping.

3.02 FIELD QUALITY CONTROL

- A. Final System Tests:
 - 1. Notify the Owner's Representative when the Work of this Section is ready for testing.
 - 2. Perform the tests in the presence of the Owner's Representative.
 - 3. Perform tests in accordance with NFPA-17. Include discharge of expellant gas test.

1.01 SECTION INCLUDES

1.02 ABBREVIATIONS

- A. IBBM: Iron body, bronze mounted.
- B. OS&Y: Outside screw and yoke.
- C. WOG: Water, oil, gas.
- D. WSP: Working steam pressure.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's catalog sheets and specifications for each valve type.
- B. Valve Schedule: List type of valve, manufacturer's model number, and size for each service application.

1.04 MAINTENANCE

- A. Special Tools:
 - 1. One wrench for each type and size wrench operated plug valve.

PART 2 PRODUCTS

2.01 VALVES - GENERAL

- A. Valve Standardization: Valves from one or more manufacturers may be used, however valves supplied for each specific valve type shall be the product of one manufacturer.
- B. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.
- C. Valve parts of same manufacturer, size and type shall be interchangeable.
- D. Manually operated gate, globe and angle valves shall be of rising stem type, unless otherwise specified.
- E. Valves which use packing, shall be capable of being packed when wide open and under full working pressure.
- F. Size valves the same size as the piping in which they are installed, unless specified otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install valves at locations noted on the drawings or specified.

3.02 VALVE APPLICATION SCHEDULE

A. Schedule of valve applications for the different services is as follows:
 1. Cold Water In Buildings and Tunnels (CW) 125 psig and Less:

- a. 3 inch and Less: A or D gates or BV balls, O globes or angles, and S or U checks; or C gates, K globes or angles, and V checks, with solder joint companion flanges.
- b. 4 inch and Up: C gates or BF butterflys, K globes or angles, and V checks.
- 2. Compressed Air (A) 125 psig and less:
 - a. 2 inches and Less: A gates, J globe or angles, and W checks.
 - b. 2-1/2 inches and Up: C gates, K globe or angles, and W checks.
- 3. Domestic Hot Water and Circulating (DHW & DHWC) 125 psig and Less:
 - a. 3 inch and Less: A or D gates or BV balls, J or O globes or angles, and S or U checks.
 - b. 4 inch and Up: C gates or BF butterflys, K globes or angles, and V checks.
- 4. Gas Natural, Manufactured or Mixed Fuel (G) 125 psig and Less:
 - a. 2 inch and Less: AB plug valves.
 - b. 2-1/2 inch and Up: AA plug valves.
- 5. Gas, Bottled Liquified Petroleum (BG): A gates, and J globes or angles, with flared or ferrule copper tubing adapters.

1.01 SECTION INCLUDES

A. General support requirements for plumbing piping

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Piping Insulation: Section 220700.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.
 - 2. Details of pipe anchors.
- B. Product Data: Catalog sheets, specifications and installation instructions for each item specified except fasteners.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with the applicable requirements of the ASME B31 Piping Codes.
 - Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.
- PART 2 PRODUCTS
- PART 3 EXECUTION

3.01 INSTALLATION

- A. Do not hang or support one pipe from another or from ductwork.1. Do not bend threaded rod.
- B. Support all insulated horizontal piping conveying fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.
- C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.
 - 1. For Steel, and Threaded Brass Pipe:

| PIPE SIZE (Inches) | MAXIMUM SPACING (Feet) |
|--------------------|------------------------|
| 1 and under | 8 |
| 1-1/4 and 1-1/2 | 9 |
| 2 | 10 |

| 2-1/2 and up | 12 |
|--------------|----|
| | |

1. For Grooved End Steel Pipe:

| PIPE SIZE (Inches) | MAXIMUM SPACING (Feet) |
|--------------------|------------------------|
| 1-1/2 and under | 7 |
| 2 through 4 | 10 |
| 5 and over | 12 |
| | |

1. No pipe length shall be left unsupported between any two coupling joints.

2. For Copper Pipe and Copper Tubing:

| PIPE OR TUBING SIZE (Inches) | MAXIMUM SPACING (Feet) |
|------------------------------|------------------------|
| 1-1/2 and under | 6 |
| 2 and over | 10 |
| | |

1. For Glass Pipe, and Aluminum Tubing:

| ТҮРЕ | 3/4 INCH AND UNDER (M | 1 INCH AND 1-1/4 INCH aximum Spacing In Fee | 1-1/2 INCH AND OVER et) |
|-----------------|-----------------------------|---|-------------------------------|
| Glass Pipe | 8 | 8 | 8 |
| Plastic Tubing | 3 | 5 | 7 |
| Aluminum Tubing | 3 | 5 | 7 |
| | | | |

1. For Plastic Tubing:

| PIPE OR TUBING SIZE (Inches) | MAXIMUM SPACING (Feet) |
|------------------------------|------------------------|
| Under 2 inch | 3 |
| 2 inch and over | 4 |
| | |

- 1. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
- 2. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
- 3. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
- 4. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

- 5. Support floor drain traps from the overhead construction, with hangers of type and design as required and approved. Overhead supports are not required for floor drain traps installed directly below earth supported concrete floors.
- D. Size hanger rods in accordance with the following:

| PIPE OR TUBING SIZE (Inches) | SINGLE ROD HANGER SIZE (Inches) | | DOUBLE ROD HANGER SIZE (Inches) | |
|------------------------------------|------------------------------------|--------|------------------------------------|--------|
| | PIPE | TUBING | PIPE | TUBING |
| 1/2 to 2 | 3/8 | 1/4 | 3/8 | 1/4 |
| 2-1/2 and 3 | 1/2 | 3/8 | 3/8 | 1/4 |
| 4 and 5 | 5/8 | 1/2 | 1/2 | 3/8 |
| 6 | 3/4 | 1/2 | 5/8 | 1/2 |
| 8, 10 and 12 | 7/8 | 5/8 | 3/4 | 5/8 |

- 1. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.
- 2. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each rod, two at upper hanger attachment and two at hanger.
- E. Vertical Piping:
 - Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
 - Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
- F. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.
- G. Underground Pipe Supports: Firmly bed pipe laid underground, on solid ground along bottom of pipe. Install masonry piers for pipe laid in disturbed or excavated soil or where suitable bearing cannot be obtained. Support pipe, laid proximate to building walls in disturbed or excavated soil, or where suitable bearing cannot be obtained, by means of wall brackets or hold-fasts secured to walls in an approved manner.

3.02 UPPER HANGER ATTACHMENTS

- A. General:
 - 1. Do not use flat bars or bent rods as upper hanger attachments.

3.03 PIPING IN TUNNELS

A. Support piping in tunnels on adjustable stanchions, fabricated in accordance with the details on the Drawings, unless otherwise indicated. Install, secure and be responsible for the proper locations of all cast-in-place inserts and stanchion supports, in ample time so as not to delay construction Work. Secure tops of stanchions to overhead construction, as required and approved.

3.04 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.05 PIPE INSULATION SHIELDS

A. Unless otherwise specified, install a pipe insulation shield, at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

3.06 PIPE COVERING PROTECTION SADDLES

A. Install pipe covering protection saddles at all points of support, for steel piping 6 inches in size and larger, insulated with hot service insulation. Weld saddles to piping to insure movement with pipe.

1.01 SECTION INCLUDES

- A. General concrete pad requirements
- 1.02 RELATED WORK SPECIFIED ELSEWHERE
 - A. Subbase for Concrete Pads: Section 310000.

1.03 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.
- 1.04 SUBMITTALS
 - A. Shop Drawings: Placing drawings for bar reinforcement.
 - B. Quality Control Submittals:
 - 1. Certificates: Bar reinforcement manufacturer's certification that bar material conforms with ASTM A 615 and specified grade.

1.05 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.

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 Owner.
- 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 Owner. Proportion mix with a minimum cement content of 611 pounds per cubic yard for 4000 psi concrete.
 - 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.
 - a. 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 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.

3.03 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.

3.04 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.

1.01 SECTION INCLUDES

1.02 REFERENCES

A. ANSI A13.1 - Scheme for Identification of Piping Systems.

1.03 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each item specified.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. W.H. Brady Co., Milwaukee, WI.
- B. Emed Co., Buffalo, NY.
- C. Panduit Corp., Tinley Park, IL.
- D. Seton Nameplate Corp., New Haven, CT.

PART 3 EXECUTION

3.01 PREPARATION

- A. Complete testing, insulation and finish painting work prior to completing the Work of this Section.
- B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.
- C. Remove dust from insulation surfaces with clean cloths prior to installing piping identification.

3.02 INSTALLATION

- A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- B. Stick-On Pipe Markers:
 - 1. Install minimum of 2 markers at each specified location, 90 degrees apart on visible side of pipe.
 - 2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.
- C. Pipe Size Labels: Install labels adjacent to each pipe marker and upstream from flow arrow. Install a minimum of 2 pipe size labels at each specified location, 90 degrees apart on visible side of pipe.
- D. Pipe Service Identification Tags: Attach tags to piping being identified with "S" hooks or jack chains.

3.03 PIPING IDENTIFICATION SCHEDULE

- A. Piping Identification Types:
 - 1. Piping or Insulation under 3/4 inch od: Pipe identification tags.
 - 2. Piping or Insulation 3/4 inch to 5-7/8 inch od: Snap-on marker or stick-on marker.
 - 3. Piping or Insulation 6 inch od and Larger: Strap-on marker or stick-on marker.
- B. Identify exposed piping, bare or insulated, as to content, size of pipe and direction of flow, with the following exceptions:
 - 1. Piping in non-walk-in tunnels or underground conduits between manholes.
 - 2. Piping in furred spaces or suspended ceilings, except at valve access panels where valves and piping shall be identified as specified for exposed piping systems.
 - 3. Piping in finished spaces such as offices, class rooms, wards, toilet rooms, shower rooms and spaces as specified.
- C. Locate piping identification to be visible from exposed points of observation.
 - 1. Locate piping identification at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs.
 - 2. Where 2 or more pipes run in parallel, place printed legend and other markers in same relative location.

3.04 VALVE IDENTIFICATION SCHEDULE

- A. Valve Service Identification Tags:
 - 1. Tag control valves, except valves at equipment, with a brass tag fastened to the valve handle or stem, marked to indicate service and numbered in sequence for the following applications:
 - a. Domestic water valves controlling mains, risers and branch runouts.
 - b. Gas valves controlling mains, risers, and branch runouts.
 - c. Valves in sprinkler and fire standpipe systems, except hose valves.
- B. Valve Service Identification Charts:
 - 1. Provide 2 framed valve charts for each piping system specified to be provided with valve identification tags. Type charts on 8-1/2 x 11 inches heavy white bond paper, indicating valve number, service and location.
 - 2. Hang framed charts at locations as directed.

1.01 SECTION INCLUDES

1.02 REFERENCES

A. Comply with the applicable requirements of ASME A112.36.2M - Cleanouts, and ASME A112.1.2 - Drainage Funnels and Air Gaps.

1.03 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for each item specified except fasteners.

1.04 MAINTENANCE

- A. Special Tools: Deliver the following to the Owner's Representative:
 - 1. Tools for Vandal Resistant Fasteners: One for each type and size.
 - 2. T-Handle Wrench for Cleanout Plugs: One for each type and size.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- B. Cleanout Plug: Lubricate threads with anti-seize lubricant before final installation.
- C. Grease Trap: Set flow control as recommended by the manufacturer's instructions.
- D. Secure external components in place with vandal resistant fasteners or devices which cannot be removed without special tools.

1.01 SECTION INCLUDES

1.02 REFERENCES

A. Unless otherwise specified, the Work of this section shall meet the applicable requirements of FS WW-P-541 - Plumbing Fixtures, and ASME A112.21.1M - Floor Drains.

1.03 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each type drain specified.

1.04 MAINTENANCE

- A. Special Tools: Deliver to the Building Owner.
- B. Tools for Vandal Resistant Fasteners: One for each type and size.

PART 2 PRODUCTS

2.01 FREE AREA OF GRATE

A. Minimum strainer grate free area listed below for each connecting pipe size:

| CONNECTING PIPE SIZE (Inches Nominal) | INTERIOR DRAINS FREE AREA (Square Inches) | EXTERIOR DRAINS FREE AREA (Square Inches) |
|---|---|---|
| 1-1/2 | 3.06 | 4.08 |
| 2 | 4.71 | 6.28 |
| 3 | 10.59 | 14.12 |
| 4 | 18.90 | 25.20 |
| 5 | 29.40 | 39.20 |
| 6 | 42.45 | 56.60 |
| 8 | 75.38 | 100.50 |

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- B. Protect weep holes from plugging during installation. Rod out weep holes after installation to remove obstructions.
- C. Set drainage flange flush with top of structural floor slab, or at elevation otherwise indicated.
- D. After membrane waterproofing installed and cured, secure clamping ring.

- E. Adjust strainer head to height indicated. If height not indicated, set at 1/2 inch below finished floor elevation.
- F. Secure external components in place with vandal resistant fasteners or devices which cannot be removed without special tools.

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Through Penetration Firestops: Section 078400.
- B. Painting: Section 099103.
- C. Pipe Hangers and Supports: Section 220529.

1.03 ABBREVIATIONS

- A. FS: Federal Specification.
- B. K: Thermal Conductivity, i.e., maximum Btu per inch thickness per hour per square foot.
- C. pcf: Pounds per cubic foot.
- D. PVC: Polyvinylchloride.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's catalog sheets, specifications and installation instructions for the following:
 - 1. Insulation Materials.
 - 2. Jacket Materials.
- B. Quality Control Submittals:
 - 1. Installers Qualification Data:
 - a. Name of each person who will be performing the Work, and their employer's name, business address and telephone number.
 - b. Furnish names and addresses of the required number of similar projects that each person has worked on which meet the qualifications.

1.05 QUALITY ASSURANCE

- A. Qualifications: The persons installing the Work of this Section and their Supervisor shall be personally experienced in mechanical insulation work and shall have been regularly employed by a company installing mechanical insulation for a minimum of 5 years.
- B. Regulatory Requirements:
 - 1. Insulation installed inside buildings, including laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.
- PART 2 PRODUCTS

PART 3 EXECUTION

- 3.01 PREPARATION
 - A. Perform the following before starting insulation Work:
 - 1. Install hangers, supports and appurtenances in their permanent locations.
 - 2. Complete testing of piping.

3. Clean and dry surfaces to be insulated.

3.02 INSTALLATION, GENERAL

- A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions unless otherwise specified.
- B. Provide continuous piping insulation and jacketing when passing thru interior wall, floor, and ceiling construction.
 - 1. At Through Penetration Firestops: Coordinate insulation densities with the requirements of approved firestop system being installed. See Section 078400.
 - a. Insulation densities required by approved firestop system may vary with the densities specified in this Section. When this occurs use the higher density insulation.
- C. Do not intermix different insulation materials on individual runs of piping.
- D. All water, soil, and waste piping exposed to freezing temperatures shall be protected from freezing by insulation, heat, or both. This included piping in unheated garages, building overhangs, and exposed storm piping.

3.03 INSTALLATION AT HANGERS AND SUPPORTS

- A. Reset and realign hangers and supports if they are displaced while installing insulation.
- B. Install high density jacketed insulation inserts at hangers and supports for insulated piping.
- C. Insulation Inserts For Use with Fibrous Glass Insulation:
 - 1. Where clevis hangers are used, install insulation shields and high density jacketed insulation inserts between shield and pipe.
 - a. Where insulation is subject to compression at points over 180 degrees apart, e.g. riser clamps, U-bolts, trapezes, etc.; fully encircle pipe with 2 protection shields and 2 high density jacketed fibrous glass insulation inserts within supporting members.
 - 1) Exception: Locations where pipe covering protection saddles are specified for hot service piping, 6 inch and larger.
- D. Insulation Inserts For Use with Flexible Elastomeric Foam Insulation:
 - 1. Where clevis hangers are used, install insulation shields with hardwood filler pieces, same thickness as adjoining insulation, inserted in undersized die cut or slotted holes in insulation at support points.
 - 2. Contour hardwood blocks to match the curvature of pipe, and shield.
 - 3. Coat dowels and blocks with insulation adhesive, and insert while still wet.
 - 4. Vapor seal outer surfaces of dowels and blocks with adhesive after insertion.
 - 5. Install filler pieces as follows:

| PIPE/TUBING SIZE | FILLER PIECES | POSITION | |
|------------------|-------------------------|---|--|
| Thru 1-1/2" | 2 dowel plugs | 6 o'clock; in tandem | |
| 2" thru 4" | 1 block, 2 dowel plugs | 6 o'clock, and 4 & 8 o'clock respectively | |
| 6" thru 8" | 2 blocks, 4 dowel plugs | 6 o'clock; in tandem and 4 & 8 o'clock; in tandem | |
| | | | |

3.04 INSTALLATION OF FIBROUS GLASS COLD SERVICE INSULATION

- A. Install insulation materials with a field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket, unless otherwise specified.
- B. Piping:
 - 1. Butt insulation joints together, continuously seal minimum 1-1/2 inch wide self-sealing longitudinal jacket laps and 3-inch wide butt adhesive backed strips.
 - a. Substitution: 3 inch wide pressure sensitive sealing tape, of same material as jacket, may be used in lieu of butt strips.
 - 2. Bed insulation in a 2-inch wide band of vapor barrier mastic, and vapor seal exposed ends of insulation with vapor barrier mastic at each butt joint between pipe insulation and equipment, fittings or flanges at the following intervals:
 - a. Horizontal Pipe Runs: 21 ft.
 - b. Vertical Pipe Runs: 9 ft.
- C. Fittings, Valves, Flanges and Irregular Surfaces:
 - 1. Insulate with mitre cut or premolded fitting insulation of same material and thickness as pipe insulation.
 - 2. Secure insulation in place with 16-gage wire, with ends twisted and turned down into insulation.
 - 3. Butt insulation against pipe insulation and bond with joint sealer.
 - 4. Insulate valves up to and including bonnets, without interfering with packing nuts.
 - 5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
 - 6. When insulating cement has dried, seal fitting, valve and flange insulation, by imbedding a layer of reinforcing membrane or 4 oz. canvas jacket between 2 flood coats of vapor barrier mastic, each 1/8 inch thick wet.
 - 7. Lap reinforcing membrane or canvas on itself and adjoining pipe insulation at least 2 inches.
 - 8. Trowel, brush or rubber glove outside coat over entire insulated surface.
 - 9. Exceptions:
 - a. Type C and D Piping Systems: Valves, fittings and flanges may be insulated with premolded PVC fitting jackets, with fibrous glass insulation inserts.
 - Additional insulation inserts are required for services with operating temperatures under 45 degrees F or where insulation thickness exceeds 1-1/2 inches. The surface temperature of PVC fitting jacket must not go below 45 degrees F.

3.05 INSTALLATION OF FIBROUS GLASS HOT SERVICE INSULATION

- A. Install insulation materials with field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket unless otherwise specified.
- B. Canvas Jackets on Piping, Fittings, Valves, Flanges, Unions, and Irregular Surfaces:
 - 1. For Piping 2 inch Size and Smaller: 4 oz per sq yd unless otherwise specified.
 - 2. For Piping Over 2 inch Size: 6 oz per sq yd unless otherwise specified.
- C. Piping:
 - 1. Butt insulation joints together, continuously seal minimum 1-1/2 inch wide self-sealing longitudinal jacket laps and 3-inch wide adhesive backed butt strips.
 - a. Substitution: 3 inch wide pressure sensitive sealing tape, of same material as the jacket, may be used in lieu of butt strips.
 - 2. Fill voids in insulation at hanger with insulating cement.
 - 3. Exceptions:

- a. Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Spaces and Concealed Piping: Butt insulation joints together and secure minimum 1-1/2 inch wide longitudinal jacket laps and 3 inch wide butt strips of same material as jacket, with outward clinching staples on maximum 4 inch centers. Fill voids in insulation at hangers with insulating cement.
- D. Fittings, Valves, Flanges and Irregular Surfaces:
 - 1. Insulate with mitre cut or premolded fitting insulation of same material and thickness as insulation.
 - 2. Secure in place with 16-gage wire, with ends twisted and turned down into insulation.
 - 3. Butt fitting, valve and flange insulation against pipe insulation, and fill voids with insulating cement.
 - 4. Insulate valves up to and including bonnets, without interfering with packing nuts.
 - 5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
 - 6. After insulating cement has dried, coat insulated surface with lagging adhesive, and apply 4 oz or 6 oz canvas jacket as required by pipe size.
 - a. Lap canvas jacket on itself and adjoining pipe insulation at least 2 inches.
 - b. Size entire canvas jacket with lagging adhesive.
 - 7. Exceptions:
 - a. In Types E, and F Service Piping Systems: Valves, fittings and flanges may be insulated with premolded PVC fitting jackets, with fibrous glass insulation inserts.
 - Additional insulation inserts are required for services with operating temperatures over 250 degrees F or where insulation thickness exceeds 1-1/2 inches. The surface temperature of PVC fitting jacket must not exceed 150 degrees F.
 - b. In Types E, and F Service Piping Systems: Insulate fittings, valves, and irregular surfaces 3 inch size and smaller with insulating cement covered with 4 oz or 6 oz canvas jacket as required by pipe size.
 - 1) Terminate pipe insulation adjacent to flanges and unions with insulating cement, trowelled down to pipe on a bevel.
 - c. Fittings, Valves, Flanges, and Irregular Surfaces In Concealed Piping, Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Rooms, Unfinished Spaces, and Tunnels: Sizing of canvas surface is not required.

3.06 INSTALLATION OF FLEXIBLE ELASTOMERIC FOAM INSULATION

- A. Where possible, slip insulation over the pipe, and seal butt joints with adhesive.
 - 1. Where the slip-on technique is not possible, slit the insulation and install.
 - 2. Re-seal with adhesive, making sure the mating surfaces are completely joined.
- B. Insulate fittings and valves with miter cut sections. Use templates provided by the manufacturer, and assemble the cut sections in accordance with the manufacturer's printed instructions.
 - 1. Insulate threaded fittings and valves with sleeved fitting covers. Over lap and seal the covers to the adjoining pipe insulation with adhesive.
- C. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.
- D. Piping Exposed Exterior to a Building, Totally Exposed to the Elements:
 - 1. Apply flexible elastomeric foam insulation to piping with adhesive.
 - 2. Apply reinforcing membrane around piping insulation with adhesive or mastic.
 - 3. Adhesive Applied System: Apply 2 coats of finish. See Section 099103.
 - 4. Mastic Applied System: Apply another coat of mastic over reinforcing membrane.

3.07 INSTALLATION OF SHEET METAL JACKETING ON PIPING

- A. Secure jacketing to insulated piping with preformed aluminum snap straps and stainless steel strapping installed with special banding wrench.
- B. Jacket exposed insulated fittings, valves and flanges with mitred sections of aluminum jacketing.
 - 1. Seal joints with sealant and secure with preformed aluminum bands.

3.08 FIELD QUALITY CONTROL

- A. Field Samples: The Owner's Representative, may at their discretion, take field samples of installed insulation for the purpose of checking materials and application. Reinsulate sample cut areas.
- 3.09 PIPING INSULATION SCHEDULE
 - A. Insulate all cold service and hot service piping, and appurtenances except where otherwise specified.
 - B. Schedule of Items Not to be Insulated:
 - 1. Chrome plated piping, unless otherwise specified.
 - 2. Exposed piping in finished spaces, serving one fixture, or piece of equipment, and which connection from the main, branch, or riser, is 24 inches or less in length.
 - 3. Water heater blow-off piping.
 - 4. Air vents, pressure reducing valves, pilot lines, safety valves, relief valves.
 - 5. Water meters.
 - 6. Piping buried in the ground, unless otherwise specified herein.
 - 7. Items installed by others, unless otherwise specified herein.
 - 8. Sanitary drainage piping, unless otherwise specified herein.
 - 9. Mechanical equipment with factory applied steel jacket.
 - 10. Hot service piping 81 degrees F to 104 degrees F.
 - 11. Flanges and unions in Type E, F, and G service piping systems.
 - 12. Sprinkler and standpipe piping, unless otherwise specified.

3.10 COLD SERVICE INSULATION MATERIAL SCHEDULE

| ТҮРЕ | SERVICE AND TEMPERATURES | INSULATION MATERIAL | PIPE SIZES (INCHES) | MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES) |
|------|--|---|-------------------------------|---|
| С | Fluids (except domestic cold water) 40 F to 80 F. | Flex. Elastomeric Foam or Fibrous Glass | 1-1/2 & less Over 1-1/2 | 1 1-1/2 |
| D | Domestic cold water, and as specified. 33 F to 80 F. | Flex. Elastomeric Foam or Fibrous Glass | All Sizes | 1/2 |
| | | | | |

A. NOTES:

- 1. Sprinkler and Standpipe Piping (First 10 feet connected to domestic water main within building): Insulate with same materials and thicknesses specified for domestic cold water.
- Roof Drain Bodies Below Roof, Horizontal Conductor Piping Including Drops, and First Fitting on Vertical conductor: Insulate with same materials and thicknesses specified for domestic cold water.
- 3. Piping Serving Handicapped Accessible Lavatories:
 - a. Insulate exposed hot and cold water supply, and waste piping with under lav piping protection cover. Install fasteners thru each pair of holes in insulated safety wrap.

3.11 HOT SERVICE INSULATION MATERIAL SCHEDULE

| | SERVICE AND TEMPERATURES | INSULATION MATERIAL | PIPE SIZES (INCHES) | MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES) |
|---|---|---|-------------------------------|---|
| Е | Water and other fluids 105 F to140 F. | Flex. Elastomeric Foam or Fibrous Glass | 1-1/2 & Less Over 1-1/2 | 1 2 |
| F | Water and other fluids 141 F to 250 F. | Fibrous Glass | 6 & Less 8 & Up | 2 2-1/2 |

3.12 SCHEDULE OF METAL JACKETING FOR INSULATED PIPE

- A. Piping Exterior to Building: Jacket insulated piping with circumferentially corrugated aluminum jacketing.
 - 1. Lap longitudinal and circumferential joints a minimum of 2 inches.
 - 2. Secure jacketing in place with 1/2 inch x 0.020 inch thick aluminum bands secured with aluminum wing type seals, on maximum 12 inch centers.
 - 3. Cover insulated fittings, valves, and offsets with mitered sections of jacketing. Seal joints with metal pipe jacket sealant, and secure with aluminum strapping and wing seals.
 - 4. Factory fabricated, preformed fitting covers of same material as jacketing may be used instead of mitered jacketing.
 - 5. Install jacketing so as to avoid trapping condensation and precipitation.

1.01 SUBMITTALS

- A. Quality Control Submittals
 - 1. Test Reports (Field Tests): Submit data for each system tested, and/or disinfected; include date performed, description, and test results for each system.

1.02 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.
 - 2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

1.03 PROJECT CONDITIONS

A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gages for field testing of systems.

1.04 SEQUENCING AND SCHEDULING

- A. Transmit written notification of proposed date and time of operational tests to the Owner's Representative at least 5 days in advance of such tests.
- B. Perform cleaning and testing Work in the presence of the Owner's Representative.
- C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems, or temporary valves or caps as required to perform the Work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Test Equipment and Instruments: Type and kind as required for the particular system under test.
- B. Test Media (air, vacuum, water): As specified for the particular piping or system under test.
- C. Cleaning Agent (water): As specified for the particular piping, apparatus or system being cleaned.

PART 3 EXECUTION

3.01 PRELIMINARY WORK

A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.

3.02 PRESSURE TESTS - PIPING

- A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.
- B. Water Systems:
 - 1. Domestic water (potable cold, domestic hot and recirculation) inside buildings:
 - a. Before fixtures, faucets, trim and accessories are connected, perform hydrostatic test at 125 psig minimum for 4 hours.
 - b. After fixtures, faucets, trim and accessories are connected, perform hydrostatic retest at 75 psig for 4 hours.
- C. Gas Piping: Before backfilling or concealment perform air test of duration and pressure as required by the local gas company. However, for gas piping designed for pressures of from 4 inches to 6 inches water column, air test at 15 inches Hg for one hour, without drop in pressure. Test gas piping with air only. Check joints for leaks with soap suds.
- D. Air Piping:
 - 1. Compressed Air: Test with air at 150 psig for one hour.
 - 2. Check joints for leaks with soap suds.
- E. Vacuum Piping: Perform air test at 150 psig for one hour, followed by a vacuum test of 25 inches Hg for one hour, during which time the mercury shall remain stationary for the last 30 minutes of test.
- F. Gasoline Piping: As Specified under the Section entitled "Fuel Dispensing System".
- G. Drainage, Vent, Conductor and Roof Drain Piping (Inside Buildings): Perform tests before fixtures are installed. Test by filling the entire system with water, and allowing to stand for 3 hours, with no noticeable loss of water. Test joints under a minimum head of 10 feet of water, except the uppermost section. Test the uppermost section to overflowing.

3.03 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

A. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting, to test opening of valves at required relief pressures.

3.04 DISINFECTION OF POTABLE WATER SYSTEMS

- A. Disinfect potable water pipe and equipment installed in the Work of this Contract.
 - 1. Completely fill the piping, including water storage equipment if installed, with a water solution containing 50 mg/L available chlorine, and allow stand for 24 hours. Operate all valves during this period to assure their proper disinfection.
 - 2. After the retention period, discharge the solution to an approved waste and flush the system thoroughly with water until substantially all traces of chlorine are removed. Drain and flush water storage equipment if installed.
- B. Connect plumbing fixtures and equipment and place the system into service. Prevent recontamination of the piping during this phase of the Work.

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Through Penetration Firestops: Section 078400.
- B. Sealants: Section 079200.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
 - 2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.

PART 2 PRODUCTS

2.01 DIELECTRIC CONNECTORS

- A. Dielectric Fitting: Bronze ball valve with end connections and pressure rating to match associated piping.
 - 1. Nipples with inert non-corrosive thermoplastic linings are not acceptable.
 - 2. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.
 - a. Rated 150 psi at 250 degrees F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and mylar sleeves; Model 150 by APS, Lafayette, LA 70596, (337) 233-6116.

2.02 PIPE SLEEVES

- A. Type A: Schedule 40 steel pipe.
- B. Type B: No. 16 gage galvanized sheet steel.
- C. Type C: Schedule 40 steel pipe with 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.
- D. Type D: No. 16 gage galvanized sheet steel with 16 gage sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install piping at approximate locations indicated, and at maximum height.
- B. Install piping clear of door swings, and above sash heads.
- C. Make allowances for expansion and contraction.

- D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.
- E. Install horizontal piping with a constant pitch, and without sags or humps.
- F. Install vertical piping plumb.

3.02 PIPE JOINT MAKE-UP

- A. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.
- B. Polyethylene Containment Pipe Joint: Follow manufacturer's printed installation instructions.
- C. High Density Polyethylene Pipe Joint (HDPE): Follow manufacturer's printed installation instructions.
- D. Hydraulic Pressed Joint: Follow manufacturer's printed installation instructions.
- E. Dissimilar Pipe Joint:
 - 1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and calk into the cast iron bell.
 - 2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
 - 3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.
 - 4. Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.
 - 5. Joining FRP and Threaded Pipe: Make up connection with adapters as recommended by manufacturers of piping being joined.

3.03 PIPING PENETRATIONS

A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:
 1. CONSTRUCTION SLEEVE TYPE

| | • •• | be deed milere pipilig period dee mail of neer | |
|-------|------|---|------------------------|
| | CO | NSTRUCTION | SLEEVE TYPE |
| i | a. | Frame construction. | None Required |
| | b. | Foundation walls. | A* |
| | c. | Non-waterproof interior walls. | B* |
| | d. | Non-waterproof interior floors on metal decks. | D* |
| | e. | Non-waterproof interior floors not on metal decks. | B* |
| | f. | Floors not on grade having a floor drain. | A |
| | g. | Floors over mechanical equipment, steam service, machine, and boiler rooms. | A |
| | h. | Floors finished or to be finished with latex composition or terrazzo, and on metal decks. | D* |
| | i. | Floors finished or to be finished with latex composition or terrazzo, and not on metal decks. | A |
| | j. | Earth supported concrete floors. | None Required |
| | k. | Exterior concrete slabs on grade. | A |
| | I. | Fixtures with floor outlet waste piping. | None Required |
| | | 221100 - 2 | Issue Date: mm-dd-yyyy |
| evill | e Fi | re District | 2/14/2025 3:27 PM |
| | | | |

| m. | Metal roof decks. | С |
|----|---------------------------------------|---|
| n. | Non-metal roof decks. | А |
| о. | Waterproof floors on metal decks. | D |
| p. | Waterproof floors not on metal decks. | А |
| q. | Waterproof walls. | А |

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

- B. Diameter of Sleeves and Core Drilled Holes:
 - 1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.
 - 2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
 - a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
 - b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.
 - c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.
 - 3. Size holes for sprinkler and fire standpipe piping in accordance with NFPA 13.
- C. Length of Sleeves (except as shown otherwise on Drawings):
 - 1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
 - 2. Floors with Finish: Equal in length to total finished thickness of floor and extending 1/2 inch above the finished floor level, except as follows:
 - a. In furred spaces at exterior walls, extend sleeve one inch above the finished floor level.
 - 3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch above the concrete slab.
 - 4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.
- D. Packing of Sleeves and Core Drilled Holes:
 - 1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 FIRESTOPPING.
 - 2. Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with Type 1C (one part) sealant. See Section 079200.
 - a. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
 - 3. Pack sleeves in exterior concrete slabs with oakum to full depth, and within 1/2 inch of top of sleeve and finish the remainder with sealant. See Section 079200.
 - a. Sealant Types:
 - 1) Piping Conveying Materials up to 140 degrees F other than Motor Fuel Dispensing System Piping: Type 1C (one part).
 - b. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
- E. Weld metal collars of Type C and D sleeves to the upper surface of the metal deck. Seal voids under the metal collar as recommended by the manufacturer of the metal deck.

3.04 PIPE AND FITTING SCHEDULE

A. Where options are given, choose only one option for each piping service. No deviations from the selected option will be allowed.

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Air Gap Fittings: Section 220576.
- 1.02 SUBMITTALS
 - A. Product Data:
 - 1. Manufacturer's catalog cuts, specifications and installation instructions for each type Vacuum Breaker.
 - 2. Manufacturer's printed test procedure for testing operation of pressure type vacuum breaker.
- 1.03 MAINTENANCE
 - A. Special Tools: One for each type and size vandal resistant fastener.

PART 2 PRODUCTS

2.01 VACUUM BREAKERS

- A. Type B: Atmospheric vacuum breaker conforming to ASSE 1001 Pipe Applied Atmospheric Type Vacuum Breakers.
 - 1. Non-pressure type with polished chrome plated brass body, disc float, silicone disc, bronze internal trim and maximum working conditions of 125 psi and 210 degrees F.
 - a. Operation: Internal disc float drops, closes orifice, and opens atmospheric vent upon back siphonage.
 - b. Connections: Female threaded inlet and outlet.
- B. Type C: Hose bibb vacuum breaker conforming to ASSE 1011 Hose Connection Vacuum Breakers.
 - 1. Frost resistant type with brass body, flat poppet type check valve, rubber disc and mating part, bronze internal trim, drainage feature, and breakaway screw or vandal resistant fastener.
 - a. Operation: Check valve closes orifice and opens atmospheric vent upon back siphonage.
 - b. Connections: 3/4 inch female hose thread inlet, and 3/4 inch hose bibb outlet.
- C. Type D: Pressure type vacuum breaker conforming to ASSE 1020 Vacuum Breakers, Anti-Siphon, Pressure Type.
 - 1. Chrome plated bronze body with spring loaded disc float and check valve; bronze internal trim, silicone rubber discs, stainless steel hood, gate valve on inlet and outlet, 2 test cocks, and maximum working conditions of 150 psi and 210 degrees F.
 - a. Operation: Internal disc float opens atmospheric vent and check valve closes inlet when line pressure drops to one psi or below.
 - b. Connections: Female threaded inlet and outlet.
- D. Type E: Handspray vacuum breaker, conforming to ASSE 1011 Hose Connection Vacuum Breakers.
 - 1. Polished chrome plated, brass body with flat poppet type check valve, rubber disc and mating part, bronze internal trim, and conforming to ASSE 1011 Hose Connection Vacuum Breakers.
 - a. Operation: Check valve closes orifice and opens atmospheric vent upon back siphonage.
 - b. Connections: 1/2 inch female threaded inlet, and 1/2 inch male threaded outlet.

A. Vandal Resistant: Allen or spanner head bolts. Phillips head and slotted head fasteners are not acceptable.

PART 3 EXECUTION

- 3.01 INSTALLATION
 - A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- 3.02 FIELD QUALITY CONTROL
 - A. Operation Test:
 - 1. Check vacuum breaker for leaking under normal operating conditions.
 - 2. Apply negative pressure to the vacuum breaker inlet, and observe that the device opens to the atmosphere.
 - 3. Type D Vacuum Breaker: Test the device in accordance with the manufacturer's printed test procedure.
 - 4. Repair or replace any device failing the operation test, and retest.

1.01 SECTION INCLUDES

1.02 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's catalog sheets, specifications, and installation instructions for each type backflow preventer and test kit.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with the State Department of Health Sanitary Code for Cross Connection Control, and the other standards listed in Part 2 of this section.
 - 2. Where conflicts occur between the referenced standards, the most stringent requirements shall apply.

1.04 MAINTENANCE

- A. Special Tools (as furnished or recommended by the backflow preventer manufacturer). Deliver to the Building Owner:
 - 1. Test Kit A: Portable, packaged in a substantially built, compartmented carrying case, containing hose, gauge, and fittings required for testing backflow preventer for proper operation, and printed procedure for conducting test.
 - 2. Test Kit B: Sight tube, of required length, for testing backflow preventer for proper operation, and printed procedure for conducting test.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.
- B. Atmospheric Vent: Pipe vent to spill over closest point of drainage, as directed, maintaining a minimum 12 inch air gap above the drain.
 - 1. Install air gap fitting when shown, or if atmospheric vent must be connected to drainage line. See Section 220576.

3.02 FIELD QUALITY CONTROL

- A. Operation Test: Test kit as specified under Part 1 of this section may be used. Conduct test in the presence of the Owner's Representative.
 - 1. Type A Backflow Preventer: Test the device with the test kit in accordance with the manufacturer's test procedures.
 - 2. Type B Backflow Preventer: Test the device with the test kit in accordance with the manufacturer's test procedure.
 - 3. Type C Backflow Preventer: Test at 125 psi hydrostatic pressure, and hold for four hours; check for leaking.
- B. Re-testing: Repair or replace any device failing the operation test, and repeat the test.

1.01 SECTION INCLUDES

1.02 SUBMITTALS

A. Product Data: Catalog sheets, specifications, dimensional data, and installation instructions for each item specified, excluding fasteners.

1.03 MAINTENANCE

- A. Special Tools: Deliver to the Owner's Representative.
 - 1. Wall Hydrant T-Handle Locking Key: One for each wall hydrant.
 - 2. Tools For Vandal Resistant Fasteners: One for each type and size.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- B. Wall Hydrants:
 - 1. Installation Height: Minimum 18 inches above finished grade.
- C. Secure external components in place with vandal resistant fasteners or devices which cannot be removed without special tools.

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Showers: Section 224223.
- 1.02 SUBMITTALS
 - A. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions for each type of mixing valve.
- 1.03 QUALITY ASSURANCE
 - A. Regulatory Requirements: Unless otherwise shown or specified, comply with the applicable requirements of FS WW-P-541.
- PART 2 PRODUCTS
- 2.01 VALVES GENERAL
 - A. Valve Body: Cast brass.
 - B. Internal Components:
 - 1. Metals: Brass, or stainless steel.
 - 2. Non-Metals: Materials not adversely affected by contact with water, temperature changes, and normal wear.
 - C. Finishes: Furnish polished, chrome plated brass, or No. 4 brush finished stainless steel on exposed to view surfaces installed in finished spaces.
 - D. Single Handle Mixing Valves:
 - 1. Operation: Valve shuts off in full cold position, and must pass through cold range before delivering warm, and/or hot water.
 - 2. Temperature Limit Stop: Factory set for 105 degrees F maximum delivery temperature.
 - 3. Automatic Shut-Down: If one supply should fail, the other will automatically and instantly shut down.

2.02 VALVE TYPES

- A. Type A: Thermostatically operated by means of bi-metallic strip, or expansion bellows.
 - 1. Accessories: Combination stop, check and removable strainer.
 - 2. Temperature Range: Cold through 115 degrees F.
- B. Type B: Single handle mechanical mixer, or individual hot and cold control valves.
 - 1. Individual Control Valves: Fit with four-arm indexed metal handles, which turn counter to each other for on and off positions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.

3.02 FIELD QUALITY CONTROL

A. Capacity Check: Operate valve through entire range, and verify rated capacity. Correct discrepancies.

END OF SECTION

2/14/2025 3:27 PM

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Valves: Section 220523.
- B. Pumps: Section 221123.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's catalog sheets, specifications and installation instructions for each item specified.
- 1.04 QUALITY ASSURANCE
 - A. Regulatory Requirements: Where Federal, NSF, ASME or other standards are indicated or required, products shall meet or exceed the standards established for material, quality, manufacture and performance.
- PART 2 PRODUCTS

2.01 MANUFACTURERS/COMPANIES

- A. Dresser Instruments.
- B. Marsh Bellofram.
- C. Moeller Instrument Co.
- D. Taylor Precision Products.
- E. H.O. Trerice Co.
- F. Weksler Instruments Corp.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Thermometers:
 - 1. Install in accordance with the manufacturer's printed installation instructions.
 - 2. Install direct reading thermometers, when the application requires installation 6 feet or less above the floor or bottom of space in which installed, and remote reading type when the installation is over 6 feet.
- B. Pressure and Vacuum Gauges:
 - 1. Install in accordance with the manufacturer's printed installation instructions.
 - 2. For measuring liquid pressure, install gauges complete with stop cocks and drain cocks.
- C. Pressure Snubbers and Impulse Dampers:
 - 1. Install pressure snubbers in the piping connections to gauges installed in suction and discharge piping connections to close coupled and base mounted circulating pumps driven by motors under 10 HP.

2. Install impulse dampers in the piping connections to gauges installed in suction and discharge piping connections to close coupled and base mounted circulating pumps driven by motors 10 HP and over.

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Wiring for Motors and Motor Controllers: Section 260523.
- B. Motors and Motor Controllers: Section 260221.

1.03 SUBMITTALS

- A. Product Data: Catalog sheets and installation instructions for each type or size pump.
- B. Schedule: Pump schedule showing pump specifications and application.
- C. Quality Control Submittals:
 - 1. Performance curves for each pump, showing gpm, brake HP and efficiency from free delivery to shut-off. Chart curves on manufacturer's factory tests shall be conducted in accordance with the recommended procedures of the Hydraulic Institute, and certified thereto by the manufacturer.
- D. Contract Close Out Submittals:
 - 1. Operation, Maintenance Data, and Parts Lists: Deliver 2 copies, for each type of pump or pumping apparatus, to the Owner's Representative.

1.04 MAINTENANCE

- A. Spare Parts: Deliver one spare set of mechanical seals for each size and type of pump equipped with mechanical seals, to the Owner's Representative, who will sign receipt for same. Furnish seals of type as required for the particular pump application and the chemical water treatment being utilized. Suitably box and label spare seals as to their usage.
- PART 2 PRODUCTS
- PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in-line circulating pumps between pipe flanges in piping systems. Install overhead pipe supports, both sides of in-line pumps, installed in horizontal piping runs.
- B. Timer and aquastat to be wired to the Circulating Pump for Building Owner flexibility.

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Valves: Section 220523.
- B. Cleaning and Testing: Section 220800.
- C. Plumbing Piping: Section 221100.

1.02 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions for each type strainer.

PART 2 PRODUCTS

- 2.01 STRAINERS
 - A. Body:
 - 1. Type:
 - a. Y.
 - b. Simplex basket.
 - c. Duplex basket.
 - 2. Materials: Either of the following:
 - a. ASTM A 126 Grade B cast iron.
 - b. ASTM A 216 WCB cast steel.
 - c. ASTM B 62 cast bronze may be used in systems operating at a maximum of 125 psig steam or 175 psig water.
 - B. Pressure Ratings:
 - 1. 125 psig WSP, 175 psig WOG.
 - 2. 250 psig WSP, 400 psig WOG.
 - C. End Connections:
 - 1. Threaded ends for use in threaded piping 3 inch size and smaller.
 - 2. Flanged ends in piping 4 inch size and larger.
 - 3. Solder ends or threaded ends with solder adapters in copper tubing.
 - D. Screens/Baskets: Fabricate from 18-8 stainless steel or monel metal.
 - 1. Perforation Sizes:
 - a. Water Piping:
 - 1) 3 inch and Smaller: 1/16 inch perforations.
 - 2) Over 3 inch: 1/8 inch perforations.
 - 2. Minimum Free Screen/Basket Area: Double the internal cross sectional area of the inlet pipe.
 - E. Caps and Covers:
 - 1. Strainers 3 inch size and Smaller: Either of the following:
 - a. Faced and gasketed screen retaining cap.
 - b. Straight thread bushing with a blow-out proof gasket.
 - c. Internally milled tapered gasketed bushing.
 - 2. Strainers 4 inch size and Larger: Bolted gasketed screen cover.
 - 3. Gasket Material: Graphited non-asbestos mineral or ceramic fiber.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide strainers in water piping 1-1/2 inch size and larger with a full size drain valve with integral hose bibb connection, and chained cap, rated for 450 degrees F.
- B. Install a short nipple and pipe cap in the blow-off outlets of strainers not specified or shown to have a blow-off valve or drain.

1.01 PRODUCTS NOT PROVIDED UNDER THIS SECTION

- A. Flashing and Trim: Construction Work Contract.
- B. Openings in Steel, Precast Concrete and Prestressed Concrete Deck Units: Construction Work Contract.

1.02 REFERENCES

A. Unless otherwise specified, the Work of this Section shall meet the applicable requirements of ASME A112.21.2 - Roof Drains.

1.03 SUBMITTALS

- A. Product Data: Catalog sheets, specifications and installation instructions.
- B. Contract Closeout Submittals:
 - 1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner's Representative.

1.04 MAINTENANCE

- A. Special Tools: Deliver to the Owner's Representative.
 - 1. Tools for Vandal Resistant Fasteners: One for each type and size.

PART 2 PRODUCTS

2.01 ROOF DRAINS

- A. Drain Body: Coated cast iron, large size sump, minimum 15 inch dia, with integral bosses or lugs drilled and tapped for fastening flashing clamp and underdeck clamp, corrosion resistant bolts, bottom outlet, and connection to match piping option selected.
- B. Flashing Clamp: Coated cast iron, non-puncturing type compression ring with integral, notched gravel stop and dome locking receiver.
- C. Water Dam: For Roof Drains designated for Emergency Use, and minimum of 2" Internal Water Dam is to be included.
- D. Dome Strainer: Coated cast iron, low profile type, with narrow vertical slotted openings, bayonet locking flange, secured with stainless steel vandal resistant fasteners.
 - 1. Minimum Dome Strainer Opening Area:

| CONNECTING PIPE SIZES (Inches Nominal) | DOME STRAINER FREE AREA (Square inches) |
|---|--|
| 2 | 18 |
| 3 | 25 |
| 4 | 36 |
| 5 | 50 |
| 6 | 70 |

- E. Sump Receiver: Galvanized steel plate, 22 gage minimum thickness, with opening sized to accept drain body flange, and flange recess of depth equal to drain sump flange thickness.
 1. Minimum Size: 4 sq. ft.
- F. Underdeck Clamp: Coated cast iron or cast aluminum, drilled to match size of bolts and tap locations in drain body.
- G. Acceptable Drain Series: Josam 21500, Smith 1010, Wade W3000, and Zurn Z100.

2.02 FASTENERS

- A. Corrosion Resistant Fasteners: Brass, bronze, or Type 302 or 304 stainless steel bolts acceptable.
- B. Vandal Resistant Fasteners: Torx head with center pin.
- C. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Broadview, IL; Molycote 1000 by Dow Corning Corp, Midland, MI; Anti-Seize Lubricant by Loctite Corp, Newington, CT.

2.03 DOWNSPOUT NOZZLE

- A. Body: Nickel Bronze with decorative wall flange and outlet nozzle. Hinged flapper or bird screen to be vandal resistant.
- B. Acceptable Drain Series: Watts RD-940-83, and Zurn ZF199.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this Section in accordance with manufacturer's printed installation instructions, unless otherwise specified.
- B. Coordinate drain installation with deck and roofing Work.
- C. Coordinate drain installation with Construction Work Contractor.
- D. Unless otherwise indicated by dimensions on the Drawings, locate drains as follows:
 - 1. Place drains minimum 3 feet away from items on roof (parapets, walls, gravelstops, pipes, vents, scuttles, equipment and curbs, etc.) to allow for flashing.
 - 2. Install drains at low points of roof deck and where normal deck deflection will be at its maximum.
- E. Drains in Cast Concrete: Set and securely brace drain body so that sump flange is level with, or slightly below surface of concrete.
- F. Drains in Wood Decks: Set sump receiver surface level with the deck surface. Secure drain body with underdeck clamp.
- G. Drains in Steel Decks: Install drains as shown on the Construction Work Drawings.
 - 1. Do not core drill or cut openings. Coordinate roof deck openings with Construction Work Contractor.
 - 2. Set sump receiver surface level with deck surface.
 - 3. Secure drain body with underdeck clamp.

- H. Drains in Pre-cast and Pre-stressed Concrete Deck Units: Install drains as shown on the Construction Work Drawings.
 - 1. Do not core drill or cut openings.
 - 2. Coordinate roof deck openings with Construction Work Contractor. Set sump receiver surface level with deck surface.
 - 3. Secure drain body with underdeck clamp.
- I. Fasteners:
 - 1. Coat bolt threads with anti-seize lubricant before final installation.
 - 2. Secure external components in place with vandal resistant fasteners or devices which cannot be removed without special tools.

1.01 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Deliver the sump frame to the Construction Work contractor for installation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 310000.
- B. Cast-In-Place Concrete: Section 033001.
- C. Painting: Section 099103.
- D. Pipe and Pipe Fittings: Section 221100.
- E. Valves: Section 220523.
- F. Wiring for Motors and Motor Controllers: Section 260523.
- G. Motors and Motor Controllers: 260221.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Catalog sheets, specifications, installation instructions, including pump capacity curve (capacity vs. head) and electrical schematics.
 - 2. Catalog sheets, specifications, and installation instructions for the sump basin and cover.
 - 3. Catalog sheets, specifications and installation instructions for the sump cover and sump frame.
- PART 2 PRODUCTS
- PART 3 EXECUTION
- 3.01 INSTALLATION
 - A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions unless otherwise specified.
 - B. Install liquid level control device at proper elevation to produce specified sump drawdown. Secure control device to pump discharge pipe with clamps or to side of sump basin with corrosion resistant brackets and fasteners.
 - C. High Water Alarm: Install high water alarm and make electrical connections. Install liquid level control device at proper elevation to activate alarm at specified liquid depth. Secure control device to pump discharge pipe with clamps or to side of sump basin with corrosion resistant brackets and fasteners.
 - D. Control Panel: Install and make electrical connections. Install liquid level control devices at elevation required to produce specified sump drawdown. Secure control devices to pump discharge pipe with clamps, or to side of sump basin with corrosion resistant brackets and fasteners.
 - E. Wall Panel: Mount wall panel where directed and secure with suitable fasteners.

- F. Prefabricated Sump: Install sump basin on a level firm base, make piping connections. Secure sump cover; seal gastight.
- G. Sump Frame: Install level at proper elevation.
- H. Install sump cover.

3.02 PUMP OPERATION

- A. Single Pump System: Set level controls to start pump when liquid depth in sump reaches 12 inches and stop pump when liquid depth is 6 inches from inlet pipe.
- B. Duplex Pump System: Set level controls to start the first (lead) pump when liquid in sump reaches 12 inches, and to start the standby (lag) pump when level rises to 6 inches from inlet pipe, and to stop both pumps when liquid depth decreases to 3 inches.
 1. Alternate lead and lag pumps with each operation cycle.
- C. High Water Alarm Setting: Set control device to sound alarm when liquid depth in the sump reaches a set height.

3.03 FIELD QUALITY CONTROL

- A. Test sump pump system for proper operation at specified liquid depths.
- B. Test high water alarm for proper operation at specified liquid depth.

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Valves: Section 220523.
- B. Electric Work: Division 26.

1.03 SUBMITTALS

- A. Product Data: Catalog sheets, specifications and installation instructions for each water heater.
- B. Contract Closeout Submittals:
 - 1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner's Representative.
 - 2. Warranty: Copy of specified warranty.

1.04 REGULATORY REQUIREMENTS

- A. Water heater shall be UL listed and labeled.
- B. Comply with the State Energy Conservation Construction Code.

1.05 WARRANTY

A. Manufacturer's Warranty: Three year warranty for the glass lined water heater tank.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- B. Install the water heater on a level, firm base.
- C. Install the pressure-temperature relief valve in the dedicated tank tapping. Pipe the relief valve blow-off to a point 6 inches above the floor.
- D. Provide ball valves on hot and cold water connections.
- E. Make final piping connections with unions.
- F. Flush and fill tank. Do not switch on heating elements until tank is full and entrapped air is eliminated.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Gas Booster Pump Systems

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Valves: Section 220523.
- B. Electric Work: Division 26.

1.03 SUBMITTALS

- A. Product Data: Catalog sheets, specifications and installation instructions for each gas booster pump system.
- B. Contract Closeout Submittals:
 - 1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner's Representative.
 - 2. Warranty: Copy of specified warranty.

1.04 REGULATORY REQUIREMENTS

- A. Water heater shall be UL listed and labeled.
- B. Comply with the State Fuel Gas Code and local requirements of Authority Having Jurisdiction.

1.05 WARRANTY

A. Manufacturer's Warranty: Fully comprehensive one (1) year parts and labor warranty.

PART 2 PRODUCTS

2.01 HERMETICALLY SEALED GAS BOOSTER SYSTEM

- A. The contractor shall furnish and install a complete U.L. listed, factory assembled, simplex gas booster system which shall be capable of delivering a variable volume of natural gas to a maximum of 3,430 cfh while providing a constant elevated differential gas pressure of 13" w.c.
- B. The system shall contain all the necessary components including a hermetically sealed gas booster, UL listed check valve, flexible pipe connectors, manual isolating shutoff valves, pressure transmitters, switches and gauges and fully integrated control system with UPS required to provide a completely automatic operating system in full accordance with the latest Utility Company and local building code requirements.
- C. The gas booster shall be U.L. listed and be of the hermetically sealed, single stage, centrifugal type which shall have demonstrated successful use in the field for a minimum of 25 years. The gas booster shall include a Class 1, Group D, 3450 RPM explosion proof motor, capable of operating on 208 volt three phase power which shall be completely accessible for service without removal of the gas booster from any system gas piping.
- D. The gas booster system shall be equivalent to model GenPac HB-4617-1-UPS-REG-N4 as manufactured by Accardi Companies, Glendale, New York or approved equal.

2.02 PIPING AND CONSTRUCTION FEATURES

- A. The complete gas booster system shall be factory pre-assembled, piped, wired, and tested including factory built piping manifolds for the inlet and discharge of the system with the following:
 - 1. U.L. listed, inlet check valve
 - 2. Inlet and discharge isolation butterfly valves
 - 3. Inlet and discharge stainless steel braided flexible connectors
 - 4. Inlet and discharge dial gas pressure gauges with shutoff cocks
 - 5. Inlet and discharge gas pressure transmitters
- B. When specified for the application, a properly sized, ANSI Z21.80 certified lockup type gas pressure regulator capable of a stated 500:1 turndown complete with inlet filter, upstream and downstream pressure gauges and field adjustable spring shall be furnished on the discharge of the gas booster system. Field installed atmospheric venting shall be required as per local code and utility company requirements. Regulators requiring electrical power to operate, not ANSI certified for line pressure use or those not capable of the stated turndown will not be accepted.

2.03 GAS BOOSTER CONTROL SYSTEM OPERATION AND DESIGN

- A. The gas booster system shall include a fully integrated and programmed, password protected, microprocessor-based control system which shall be designed to operate the gas booster automatically and safely on a demand from the gas-fired equipment in the building through hard wired interlocks.
- B. The control system shall be factory mounted and wired on the gas booster system skid and shall include as a minimum the following:
 - 1. NEMA 4 rated control panel with main power disconnect switch
 - 2. Indicating lights for "Power On", "Booster On", "Low Inlet Gas Pressure" and "Low Discharge Gas Pressure".
 - 3. Manual On/Off selector switch
 - 4. 4" alarm bell and PB silencing switch
 - 5. Onboard system alarm history, trending, and scheduling without the need for additional components or remote devices.
 - 6. Remote start/stop interlocks for field wiring connections to the gas fired generator
 - 7. Emergency Estop push button switch
 - 8. Common SPDT alarm output.
 - 9. Pre-wired and numbered terminal strip
- C. The control system shall be designed to maintain the required pressure to the inlet of the generator at all times in order to ensure reliable start and run reliability. It shall also include an adequately sized (UPS) uninterruptable power supply sized to match the booster electrical requirements and start and run the booster for a minimum of 8 minutes on an interruption of main building power. The UPS shall be shipped loose and installed and wired to the gas booster panel by others.
- D. A code required manual reset low inlet gas pressure switch shall be furnished, field wired and installed by the contractor in the location designated by the local utility company. The switch will be set to interrupt the operation of the gas booster when the available inlet gas pressure drops to 3" W.C. or less.
- E. The complete gas booster control system shall be similar to model HBP-1-UPS-N4 or approved equal.

2.04 DESIGN COORDINATION, FIELD SUPPORT AND QUALITY ASSURANCE

- A. To ensure proper operating integrity the gas booster system shall be completely tested at the factory prior to shipment to the job site and shall include a written certification of performance and warranty.
- B. For this purpose, any potential substitution of the specified product shall include a written comparison and statement of compliance with all aspects of the specification included within a detailed submittal.
- C. The booster manufacturer shall provide all required field service assistance for installation supervision, equipment start-up, commissioning, and training. These services shall include as a minimum one individual day of pre-start check and supervision, one individual day of system start up and one individual day of training to operating personnel.
- D. Additionally, the gas booster system shall be covered as standard by a fully comprehensive one (1) year parts and labor warranty which shall be stated in the equipment submittal.

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Sealants: Section 079200.

1.03 SUBMITTALS

- A. Product Data: Catalog sheets, specifications, roughing dimensions, and installation instructions for each item specified except fasteners.
 - 1. Deliver cut out data for countertop fixtures to the Owner's Representative.
- B. Samples:
 - 1. Water Closet Seat: One seat if other than product specified. Sample will be returned and if approved, may be installed on the Project.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with applicable requirements of FS WW-P-541, and the following standards:
 - a. ANSI/ASME A112.6.1M Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.
 - b. ANSI/ASME A112.18.1M Plumbing Fixture Fittings.
 - c. ANSI/ASME A112.19.1M Enameled Cast Iron Plumbing Fixtures.
 - d. ANSI/ASME A112.19.2M Vitreous China Plumbing Fixtures.
 - e. ANSI/ASME A112.19.6 Hydraulic Requirements for Water Closets and Urinals.
 - 2. Materials and installations designated as handicapped accessible shall conform with the following:
 - a. ANSI A117.1 Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People.
 - b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).
 - c. The Uniform Federal Accessibility Standards (UFAS), (Appendix A to 41 CFR Part 101-19.6).
 - 3. Each fixture carrier support shall be listed by model number in the fixture support manufacturer's Fixture Support Selection Guide as being recommended for support of the appropriate fixture.
- B. Plainly and permanently mark each fixture and fitting with the manufacturer's name or trade mark.
- C. Acid resistant surfaces shall be plainly and permanently marked with the manufacturer's label or symbol indicating acid resistance.

1.05 MAINTENANCE

- A. Special Tools: Deliver to the Owner's Representative.
 - Furnish the following tools labeled with names and locations where used.
 a. Keys for stops (furnished with stops).
 - b. Tools for Vandal Resistant Fasteners: Two for each type and size.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

- A. Vitreous China: First quality, smooth, uniform color and texture, with fused on glaze covering surfaces exposed to view.
 - 1. Surfaces shall be free of chips, craze, warpage, cracks and discolorations. Surfaces in contact with walls or floors shall be flat, with warpage not to exceed 1/16 inch per foot.
 - 2. Color: White.
- B. Porcelain Enameled Cast Iron: Smooth, uniform color and texture, having fused on glaze covering surfaces exposed to view.
 - 1. Material shall show no cracks, chips, craze or discolorations.
 - 2. Enameled surfaces shall be acid resistant unless otherwise specified.
 - 3. Color: White.
- C. Fixture Trim: Brass, bronze, or stainless steel construction; consisting of supply and waste fittings, faucets, traps, stop valves, escutcheons, sink strainers, nipples, supplies, and metal trim.
 - 1. Brass piping: Ips standard weight, with standard weight, 125 lb cast brass fittings.
 - 2. Brass tubing: 18 B & S gage.
 - 3. Stainless steel: 18-8 Type 302 or 304 unless otherwise specified.
- D. Fixture Trim Finishes:
 - 1. Brass or Bronze: Polished or satin finished chrome plating, 0.02 mil chromium over 0.2 mil nickel plating.
 - 2. Stainless Steel: Invisible welds and seams, and unless otherwise specified, polished to No. 4 commercial finish.
- E. Fixture Hold-down Bolts: Steel, plated for corrosion resistance.
 - 1. Cap nuts: Metal, polished and chrome plated.
- F. Combination Faucets: Faucets shall turn counter to each other for the on and off positions.
- G. For Vandal Resistant Fixtures Fasteners: Torx head with center pin.

PART 3 EXECUTION

3.01 FIXTURE SUPPORT AND SUPPORTING DEVICE INSTALLATION

- A. Install heavy duty floor mounted carrier supports with specified fixture supporting devices for wall type plumbing fixtures.
 - 1. Secure to building construction with lag bolts and metal expansion shields, or other appropriate means as required by the construction encountered.
- B. Wall Mounted Carrier Supports: Install the following fixtures on wall mounted carrier supports:
- C. Fixture Supporting Devices: Attach fixtures by means of the following fixture supporting devices attached to carrier supports.

| FIXTURE | SUPPORTING DEVICE | |
|-------------------------------------|---------------------------|--|
| Clinical Service Sink | Fixture hangers & bearing | |
| Lavatory, Vitreous China, with back | Concealed arms. | |
| Lavatory, Vitreous China, slab type | Concealed arms. | |

| Lavatory, Type D | Concealed arms. |
|-----------------------------|---|
| Lavatory, Type E | Through bolt. |
| Water Closet | Bolt to comb. carrier and drainage fitting. |
| Urinal | Fixture hanger and bearing plate. |
| Drinking Fountain | Fixture hanger. |
| Water Cooler (wall mounted) | Fixture hanger. |
| Water Cooler (Recessed) | Mounting frame. |

D. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

3.02 FIXTURE INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.
- B. Install fixtures level and at proper height, tighten connections, and install hold-down bolts, cap nuts and cover plates, where required.
- C. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.
- D. Bathtubs:
 - 1. Residential Type:
 - a. Caulk joint between fixture wall and floor with Type 1D sealant; strike a neat joint.
- E. Mop Service Sinks:
 - 1. Set receptor leveled in bed of mortar laid on clean roughened surface. Remove excess mortar and strike a neat joint.
 - 2. Make connection from drainage pipe to receptor drain.
 - 3. Caulk joints between receptor and wall or floor with Type 1D sealant; strike a neat joint.
 - 4. Install service fittings.
- F. Lavatories:
 - 1. Mount lavatories 31 inches from finished floor to rim unless otherwise specified.
 - Mount handicapped accessible fixtures 34 inches from finished floor to rim. Refer to Standard Drawing No. 93/S3013 bound herein, for special clearances required for handicapped accessible fixtures.
 - 3. Caulk joint between fixture back and wall with Type 1D sealant; strike a neat joint.
- G. Countertop Fixtures:
 - 1. Install fixture with securing devices supplied.
 - 2. Set fixture on bedding of sealant, tighten securing devices and remove excess sealant.
- H. Water Closets:
 - 1. Wall Hung Fixtures:
 - a. Standard Fixtures: Install wall hung fixtures 15 inches from finished floor to rim unless otherwise specified.
 - b. Handicapped Accessible Fixtures: Install fixtures 18 inches from finished floor to top of seat (16-13/16 inches floor to rim based on 1-3/16 inches seat height).
 - c. Set bearing nuts to position fixture 1/16 inch clear of finished wall.
 - d. Caulk the joint between fixture back and wall with Type 1D sealant; strike a neat joint.
 - 2. Floor Supported Fixtures:

- a. Set fixture in bed of setting compound; remove excess.
- b. Caulk base perimeter with Type 1D sealant; strike a neat joint.
- 3. After connections are tightened, install cap nuts and washers.
- 4. Install water closet seats when directed.
- I. Urinals:
 - 1. Wall Hung Fixtures:
 - a. Standard Fixtures: Install wall hung fixtures 24 inches from finished floor to rim.
 - b. Handicapped Accessible Fixtures: Install wall hung handicapped accessible fixtures 14 inches (minimum) to 17 inches (maximum) from finished floor to rim.
 - c. Set bearing nuts on floor mounted carrier supports to position wall hung fixtures 1/16 inch clear of finished wall.
 - d. Caulk the joint between fixture back and wall with Type 1D sealant; strike a neat joint.
 - 2. Floor Supported Fixtures:
 - a. Install lip of urinal below floor level for proper floor drainage.
 - b. Set fixture in bed of setting compound; remove excess.
 - c. Caulk perimeter of fixture with Type 1D sealant; strike a neat joint.
 - 3. After connections are tightened, install cap nuts and washers.
- J. Flush Valves:
 - 1. Standard Fixtures: Install flush valves on fixture centerline, and at following heights above fixture rim or back to centerline of water inlet to flush valve.
 - a. Water Closet: 11-1/2 inches.
 - b. Urinal: 11-1/2 inches.
 - 2. Handicapped Accessible Fixtures: Install flush valves on fixture centerline, and at following height above finished floor to centerline of flush valve operator. Distance between centerline of flush valve operator and centerline of water inlet is 1-1/2 inches.
 - a. Water Closet: Approximately 31-1/2 inches, and mounted on wide side of stall.
 - 1) Coordinate mounting height with Construction Work Contractor to avoid interference with grab bar, and to facilitate flush valve servicing.
 - b. Urinal: Maximum 44 inches.
 - 3. Set oscillating handles parallel to wall on exposed installation.
 - 4. Slip joints in flush pipe connections allowed only at fixture spud and vacuum breaker ends; others shall be screwed connections.
 - 5. Score tubing ends before assembling to assure tight slip joint connections. No score marks shall be visible after assembly.
 - 6. In utility corridors, solder screwed flush pipe connections.

3.03 CLEANING, FLUSHING AND ADJUSTMENT

- A. Clean fixture and trim. Remove grease and dirt; polish surfaces but leave stickers and warning labels intact.
- B. Flush supply piping and traps; clean strainers.
- C. Adjust stops for proper delivery.
- D. Adjust metering faucets for proper timing.

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Pipe and Pipe Fittings: Section 221100.
- B. Sealants: Section 079200.

1.02 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions for each item including location and size of openings for shower head and mixing valve.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with applicable requirements of FS WW-P-541 unless otherwise specified.
 - 2. Materials and installations designated as handicapped accessible shall conform with the following:
 - a. ANSI A117.1 Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People.
 - b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).
 - c. The Uniform Federal Accessibility Standards (UFAS), (Appendix A to 41 CFR Part 101-19.6).

1.04 MAINTENANCE

A. Special Tools: One tool for each type and size vandal resistant fasteners.

PART 2 PRODUCTS

2.01 MATERIALS

A. Shower: See plans for make and model.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions except as specified otherwise.
- B. Piping from Shower mixing valve to the tub spout shall be copper. No other pipe material is allowed.
- C. Mounting Heights (Unless otherwise indicated): Distance between finished floor and centerline of item.
 - 1. Standard Showers:
 - a. Shower Heads: 76 inches.
 - b. Mixing Valves: 54 inches.
 - 2. Handicapped Accessible Showers:
 - a. Shower Heads:
 - 1) Hand Held Type: 48 inches.
 - 2) Fixed Type: 48 inches.

- b. Operating Controls (diverters, metering valves, mixing valves, etc.): 38 inches (minimum), 48 inches (maximum).
- D. Installing Receptor On Masonry Floors:
 - 1. Remove base or cove moulding.
 - 2. Level receptor on mortar setting bed. Tool mortar back 3/8 inch from edges.
 - 3. Apply sealant to mortar joint flush with face of receptor. Tool to a smooth cove shape between receptor and floor.
 - 4. Calk drain connection with lead and oakum.
- E. Installing Receptor On Wood Floors:
 - 1. Remove floor covering at location of receptor.
 - 2. Level receptor on mortar setting bed. Tool mortar back 3/8 inch from edges.
 - 3. Apply sealant to mortar joint flush with face of receptor. Tool to a smooth cove shape between receptor and floor.
 - 4. Calk drain connection with lead and oakum.
- F. Operate mixing valve through its entire range; check for rated capacity.
- G. Set mixing valve at full hot position and check delivered water temperature. Adjust the temperature limit stop for maximum 105 degrees F delivered water temperature.
- H. Vandal Resistant Shower Heads:
 - 1. Set and lock in place spray angle and delivery volume on all adjustable heads.
 - 2. Test volume for delivery specified.
- I. Calk the space between wall shower units, shrouds (where required), and walls with Type 1D sealant; strike a neat joint.

3.02 CLEANING

A. Remove protective coatings and thoroughly clean all exposed surfaces after all other trades have completed their Work.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General requirements for drinking fountains
- 1.02 RELATED WORK SPECIFIED ELSEWHERE
 - A. Fixture Carrier Supports: Section 224200.
- 1.03 SUBMITTALS
 - A. Product Data: Manufacturer's catalog sheets, specifications and installation instructions for each type drinking fountain.
 - B. Contract Closeout Submittals:
 - 1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner's Representative.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with applicable requirements of FS WW-P-541 unless otherwise specified.
 - 2. Comply with the Federal Safe Water Drinking Act of 1986, and the Federal Lead Contamination Control Act of 1988.
 - 3. Materials and installations designated as handicapped accessible shall conform with the following:
 - a. ANSI A117.1 Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People.
 - b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).
 - c. The Uniform Federal Accessibility Standards (UFAS), (Appendix A to 41 CFR Part 101-19.6).

PART 2 PRODUCTS

2.01 DRINKING FOUNTAINS

- A. Type: Wall mounted, factory assembled, complete with trap, shut off valve and wall hanger.
- B. Body: Polished or satin finished stainless steel, 18 gauge or heavier; with rounded corners, anti-splash back, and receptor contoured to eliminate splashing.
- C. Features: Self closing supply valve, automatic stream regulator, two stream mound building projector and removable brass strainer plate.
 - 1. All exposed brass trim polished and chrome plated.
- D. Selections: Refer to Contract Documents for Manufacturer and Model Number.
 - 1. Approved Manufacturers:
 - a. Elkay, Murdock, Haws, Halsey Taylor, Oasis
- E. Fixture Hanger: Steel, designed to mount fixture to fixture support, as furnished by drinking fountain manufacturer. See Section 224200.
- F. Selections: Refer to Contract Documents for Manufacturer and Model Number.

2.02 FASTENERS

A. Vandal Resistant Fasteners: Torx head with center pin.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.
- B. Standard Fixture Mounting Height (unless otherwise indicated on the Drawings): Distance finished floor to rim.
 - 1. Adult Usage: 40 inches.
 - 2. Child Usage: 29 inches.

3.02 CLEANING, FLUSHING AND ADJUSTMENT

- A. Clean and polish fixture and trim.
- B. Flush piping; clean strainers and trap.
- C. Adjust for proper delivery.

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. AABC American Air Balance Council
 - 3. ADC Air Diffusion Council
 - 4. AGA American Gas Association
 - 5. AMCA Air Moving and Conditioning Association
 - 6. ANSI American National Standards Institute
 - 7. ARI American Refrigeration Institute
 - 8. ASA Acoustical Society of America
 - 9. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
 - 10. ASME American Society of Mechanical Engineers
 - 11. ASSE American Society of Sanitary Engineers
 - 12. ASTM American Society for Testing Materials
 - 13. AWS American Welding Society
 - 14. AWWA American Water Works Association
 - 15. BSA Board of Standards and Appeals
 - 16. FM Factory Mutual
 - 17. F.S. or FED Spec. Federal Specification
 - 18. IRI Industrial Risk Insurers
 - 19. MEA Materials and Equipment Acceptance

| 20. | MSS | Manufacturer's Standardization Society of the Valve and Fitting Industry |
|-----|--------|---|
| 21. | NACE | National Association or Corrosion Engineers |
| 22. | NEBB | National Environmental Balancing Bureau |
| 23. | NEC | National Electrical Code (NFPA 70) / 2020 |
| 24. | NEMA | National Electrical Manufacturers Association |
| 25. | NFPA | National Fire Protection Association |
| 26. | OSHA | Occupational Safety and Health Act |
| 27. | SMACNA | Sheet Metal and Air Conditioning Contractor's National Association |
| 28. | TEMA | Tubular Exchanger Manufacturers Association |
| 29. | UL | Underwriters Laboratories, Inc. |
| 30. | USAS | USA Standards Institute (Formerly ASA) |
| | | |

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 no 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.
 - 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 2020 or later in .dwg format. Upon completion of the Work, submit a digital copy (PDF) to the Architect/Engineer for approval of the record drawings, of the same size as the Drawings for approval. Upon approval by the Architect/Engineer furnish the Owner a digital copy (PDF) of the record drawings along with one hard copy for the Owner's 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
 - 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. Field Review and Punchlist:

- 1. Contractor shall submit written notice of substantial completion prior to requesting 'Substantial Completion Punchlist Inspection'.
- 2. Contractor shall submit all air and hydronic test balance reports a minimum of 5 days prior to requesting punchlist inspection. The reports shall be complete for all subject equipment. If any reports are missing or incomplete, contractor shall identify those items and provide a schedule of balancing completion and excepted report submission.
- 3. As applicable, contractor shall provide written record of successful piping pressure test for each piping system, on company letterhead, with required data per specification, duration of test, and photographic evidence of gauge at test pressure.
 - a. The contractor shall provide a written response to the punchlist items within 2 weeks of receipt of punchlist with a schedule of completion of the open items (or commentary if discussion or objection are raised).
- 4. If contractor requests a punchlist inspection and engineer finds incomplete work within the work claimed to be substantially complete, the engineer will inform the contractor and may (at engineer's choice) terminate the inspection prior to reviewing all work. The Contractor will be responsible for reimbursing engineer for subsequent punchlist activities.
- 5. Upon receipt of engineer's punchlist inspection report, the contractor shall respond to each comment with an acknowledgement of each item (initialled, dated and photo evidence of completed work) or disagreement and written explanation of disagreement.
- 6. The contactor may respond with acknowledgement by providing photo of corrective action, or at the engineer's choice and upon contractor's written confirmation that all punchlist items have been addressed, may request a final punchlist inspection.
- B. 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.
- C. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.
- D. 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
- E. Warranties, bonds, maintenance agreements, and similar continuing commitments.
- F. 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.

G. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

Η.

| Systems or Equipment | Training Time (Hours) |
|-------------------------------|-----------------------|
| VRF Heat Recovery Systems | 16 hrs. |
| Dedicated Outdoor Air Systems | 16 hrs. |
| Kitchen MAU and Exhaust | 8 hrs. |
| Exhaust Fans | 8 hrs. |
| Gas Fired Unit Heaters | 8 hrs. |
| Roof Top Units | 8 hrs. |
| Air Handlers | 8 hrs. |
| DDC Control System | 24 hrs. |
| All other equipment | 4 hrs. (each) |

Note: Consult individual equipment specification sections for additional training requirements.

- I. Prepare a written agenda for each session and submit for review and approval. Include date, location, purpose, specific scope, proposed attendance and session duration.
- J. Record training sessions in digital format, format as selected by the Owner. Turn over digital files to the Owner after training has been completed.

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 piping.
- 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 SP89 Pipe Hangers and Supports Fabrication and Installation Practices

1.03 QUALITY ASSURANCEL

- 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: ha
 - 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-58 and NYS 2020 Mechanical Code, excerpts of which follow below:

| NOMINAL PIPE SIZE (INCHES) | ROD DIAMETER (INCHES) | MAXIMUM SPACING (FEET) |
|-------------------------------|--------------------------|---------------------------|
| 1/2 to 1-1/4 | 3/8 | 7 |
| 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 | 12 |
| 4 | 5/8 | 12 |
| 5 | 5/8 | 12 |
| 6 | 3/4 | 12 |
| 8 | 3/4 | 12 |
| 10 | 7/8 | 12 |
| 12 | 7/8 | 12 |
| 14 | 1 | 12 |
| 16 | 1 | 12 |

G. Support horizontal copper tubing in accordance with MSS SP-58 and NYS 2020 Mechanical Code, excerpts of which follow below:

| NOMINAL PIPE SIZE (INCHES) | ROD DIAMETER (INCHES) | MAXIMUM SPACING (FEET) |
|-------------------------------|--------------------------|---------------------------|
| 1/2 to 3/4 | 3/8 | 5 |
| 1 | 3/8 | 6 |
| 1-1/4 | 3/8 | 7 |
| 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 | 12 |
| 6 | 5/8 | 12 |
| 8 | 3/4 | 12 |

- H. 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.
- I. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.
- J. Place a hanger within 12 inches of each horizontal elbow.
- K. 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.
- L. 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.
- M. Do not support piping from other pipes, ductwork or other equipment that is not building structure.
- N. Where horizontal piping movements are greater than ½ 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.
- O. 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. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

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.

- 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.
 - B. Where VAV boxes, hot water reheat coils, or other mechanical devices are installed above a lay-in ceiling tile system, provide and install color coded thumb tabs to mark the location of the equipment above the ceiling.

3.04 SCHEDULES

A. Pipe Marker Letter Size Schedule:

| Outside diameter of insulation or pipe Inches | Letter height Inches | Color field Inches |
|---|-------------------------|-----------------------|
| 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 |

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section specifies requirements for testing, adjusting, and balancing of all air 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 01 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 Article 1.04 "Quality Assurance" below, 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 digital (PDF) of draft reports.
 - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit digital (PDF) 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. Divide the contents into the below listed divisions, separating them by divider pages with titles descriptive of the contents:
 - 1) General Information and Summary.
 - 2) Air Systems.
 - b. Report Contents: Provide the following minimum information, forms and data:
 - 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.
- Calibration Reports: Submit proof that all required instrumentation has been C. calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.
- Existing Systems: Where existing systems are to be added to or modified include in d. the report results of operational tests taken prior to modifications including but not limited to existing fan 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:
 - American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 1.
 - 2 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - 3. National Environmental Balancing Bureau (NEBB)
 - Associated Air Balance Council (AABC) 4
- Set the air delivery or intake of each diffuser, grille and register to be as designed or within five В. 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

Require the testing and balancing specialist to review his/her work with the respective A. manufacturers of the equipment and devices involved, and coordinate and schedule all work.

H2M

- B. Furnish and install balancing dampers, pressure taps, gauges, 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 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 equipment, air outlets (supply, return and exhaust), 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 fan 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. Where existing systems are to be modified or added to ensure that all 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 distribution systems have been satisfactorily completed.
- F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.
- G. Cut insulation and ductwork 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.
- I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air 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
- L. 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.

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 078413 Through Penetration Firestopping for HVAC Systems
- B. Section 079201 Non Fire Rated Sleeves and Seals
- C. Section 232000 Pipe, Valves, and Fittings
- D. Section 232300 Refrigerant Piping

1.03 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 255 Surface Burning Characteristics of Building Materials.
- B. New York:
 - 1. Mechanical Code of New York State 2020
 - 2. Energy Conservation Construction Code 2020
 - 3. ASHRAE 90.1 2016
- C. Greenguard
- D. Underwriters Laboratories, Inc. (UL):
 1. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials.
- E. 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 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 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 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; use molded tubular material wherever possible.

2.02 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.

2.03 HIGH DENSITY JACKETED INSULATION INSERTS FOR HANGERS AND SUPPORTS

- A. For Use with Flexible Elastomeric Foam Insulation:
 - 1. Provide to prevent thermal bridging and formation of condensation.
 - a. Provide insulated piping supports at clamping points to prevent crushing and cross section area reduction of insulation.
 - b. Load bearing PET or closed cell EPDM core.
 - c. UV degradation resistant exterior
 - d. Outside diameter shall match insulation sizes
 - e. Armacell ArmaFix EcoLight, Aeroflex Arefix, or equal

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

| 11/2" to 21/2" 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.

3.03 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.

3.04 PIPING INSULATION MATERIAL SCHEDULE

| SYSTEM OR SERVICE | LOCATION | INSULATION TYPE | JACKET |
|------------------------|----------|-----------------|------------------|
| CONDENSATE DRAINS | INSIDE | ELASTOMERIC | |
| HVAC REFRIGERANT LINES | INSIDE | ELASTOMERIC | |
| HVAC REFRIGERANT LINES | OUTSIDE | ELASTOMERIC | EXTERIOR COATING |

3.05 MINIMUM PIPING INSULATION THICKNESS (IN.)

| FLUID OPERATING | SYSTEMS IN TEMP. | INSULATION CONDUCTIVITY | | NOMINAL PIPE OR TUBE SIZE (IN.) | | | | |
|------------------------|---------------------|---|-----------------------------|------------------------------------|--------------------|--------------------|----------------|-----|
| TEMP. RANGE (°F) | RANGE (°F) | CONDUCTIVITY BTU*IN./(H*SQ. FT.*°F) | MEAN RATING TEMP (°F) | <1 | 1 TO < 1-1/2 | 1-1/2 TO < 4 | 4 TO < 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

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. New York:

- 1. Mechanical Code of New York State 2020
- 2. Energy Conservation Construction Code 2020
- 3. ASHRAE 90.1 2016
- C. Greenguard
- 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 C553 Types I, II and III, and ASTM C1290; Greenguard compliant.

- B. Factory Applied Vapor Retarder Jacket: FSK or PSK conforming to ASTM C1136 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 C612 Type IA and IB.
- B. Mean temperature by ASTM C177 and a maximum service temperature of 450° F.
- C. Factory Applied Vapor Retarder Jacket: ASJ conforming to ASTM C1136 Type I, or FSK or PSK conforming to ASTM C1136 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 ACOUSTIC DUCT LINER

- A. Conforming to ASTM C1071 Type 1 and NFPA 90A & 90B.
- B. Noise Reduction Coefficient (NRC): ASTM C423 Type A Mounting, 0.40 or higher for 1/2" 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 HydroshieldÔ 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 D1970/D1970M, 40 mils Nominal
- E. Flexibility: ASTM D1970/D1970M, Pass.
- F. Vapor Permeance: ASTM E96/E96M, 0 perms.
- G. Nail Sealability: ASTM D1970/D1970M, Pass.
- H. Heat Aging: ASTM D 794, Pass.
- I. Tear Resistance: ASTM D 1424, Average: 660 grams.
- J. Ultimate Elongation MD: ASTM D412, 434 percent.
- K. Ultimate Elongation CMD: ASTM D412, 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 E84, 0.
- N. Smoke Density Index: ASTM E84, 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 C518 at 75°F.
- 4. Flame Spread: <25 when tested in accordance with ASTM E84.
- 5. Smoke Spread: <50 when tested in accordance with ASTM E84.

D. Approved Products:

1. FireMaster FastWrap XL by Thermal Ceramics.

2.07 FIRE RATED BLANKET INSULATION ACCESSORIES

- A. Glass Filament Tape: Minimum 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: ½ inch wide and 0.015 inch thick.
- D. Steel Insulation Pins: Minimum 12 gauge, 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

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 ¹/₂ inches greater than the height of the seam or angle covered over the standing seam or angle.

3.04 ACOUSTIC DUCT LINER

- 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 1/8 inch relative to the nominal thickness of the insulation.
- C. Adhesive shall conform to ASTM C916. 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 C916.
- 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 E2336.
 - 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 | Туре | 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 Upstream and Downstream of Air Handling Units and Supply and Return Fans, Located Indoors | Internal Acoustic Duct Lining | Note 1, 2 | |
| Ductwork Upstream and Downstream of Air Handling Units and Supply and Return Fans, Located Outdoors | Internal Acoustic Duct Lining | Note 1, 2 | |
| General Exhaust Ducts Except as Noted | Uninsulated | NA | |

Notes:

- 1. Ductwork to be provided with 1-inch internal acoustic lining in addition to externally applied insulation in accordance with the table above.
- 2. Unless noted otherwise on drawings, duct liner shall be continuous, extending from air handling unit/fan sections out for a linear distance of 20'.
- B. Interior Concealed Range Hood and Elevated Temperature Exhaust Ducts

| Ductwork System | Туре | Thickness (In) |
|-----------------|------|----------------|
| | | |

Kitchen Hood Exhaust Ducts | Fire Rated Blanket | Two layers 1-1/2" Each

END OF SECTION

PART 1 - GENERAL

1.01 COMMISSIONING CONTRACT

A. The Owner will employ an independent Commissioning Authority (CA). The mechanical contractor shall support all commissioning efforts as defined here-in and as required by the CA, in reference specifications or as otherwise required under standard care of the type of project and it's delivery.

1.02 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.
- C. The Contractors should also review the applicable sections of Specifications Section 019113 for additional information, as well as the associated references througout this specifications.
- D. 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.
- E. 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.
- F. 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.

1.03 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.

1.04 MECHANICAL 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 required here-in.
- D. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as per section 019113.
- E. 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.
- I. 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.
- (I) 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.

1.05 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.

1.06 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 required here-in.
- D. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as per section 019113.
- E. 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.
- I. 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.
- (I) 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. Indoor Air Handling Units (FCU-104, 105, 107, 202)
 - 2. Exhaust Fans (GXF 1 to 16)
 - 3. Dedicated Outdoor Air Units (DOAS-1)
 - 4. Gas Fired Unit Heaters (GUH-1 to 9)
 - 5. Rooftop Unit (RTU-A&B)
 - 6. Electric Unit Heaters (EUH-1 to 6)
 - 7. Electric Cabinet Unit Heaters (ECUH-1, ECUH-2)
 - 8. HVLS Fans (HVLS-1,2,3)
 - 9. VRF SYSTEMS (CU-1A, CU-1B, CU-1C, DSCU-1,2,3, DSEU-1,2,3, FCU-104, 105, 107, 202, EU-100A, EU-100B, EU-102, EU-106, EU-109, EU-200, EU-201, EU-203, EU-205, EU-206, BC-1, BC-2)
 - 10. Make up Air Unit (CMAU-1)
 - 11. Kitchen Exhaust System (KX-1)
 - 12. Vehicle Exhaust Fans (VX-1,2)
 - 13. ATC System (test functionality as it has been modified by systems above)
 - 14. Equipment tags listed above are for convenience only. All equipment in each system shall be commissioned.

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.
- B. 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 to 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

- Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just A. 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 is 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.
- B. A detailed listing of O&M requirements is listed in Section 019113.
- C. 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 and other applicable section, prior to the training of owner personnel.
- D. The CA shall receive a copy of the O&M manuals for review.
- E. 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.
- F. 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

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, and meeting current energy code. 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 ½ 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: Greenheck (VDC-23), Arrow or approved equal.

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 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).

2.04 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.

2.05 HUMIDITY SENSORS

- A. Room Humidity sensors shall have an accuracy of ±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 ±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.

2.06 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.

2.07 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.

2.08 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.

2.09 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.

2.10 WALL MOUNTED CARBON DIOXIDE SENSORS

- A. Carbon dioxide sensors shall be of the wall mounted type.
- B. Sensors shall be of the auto-calibrated type designed to operate from 24VAC or 24VDC power.
- C. Range: 0-2000 ppm CO2
- D. Accuracy: ±30 ppm CO2 + 3% of reading
- E. Annual Zero Drift: ±10 ppm

- F. Response Time: < 3 minutes
- G. Output Signals:
 1. 0-10 VDC
 2. 4-10 mA or 2-10 VDC
- H. Resolution of Analog Outputs: 2 ppm CO2
- I. Housing Material: Polycarbonate/ABS blend
- J. 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.

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 which ever 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:

CAUTION

This equipment is operating under automatic control and may start at any time without warning.

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

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 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. Division 26
 - B. 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, if applicable. 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, if applicable.
 - 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, if applicable.
 - 6. All space sensors and thermostats shall have an LCD display indicating their setpoint, the condition sensed and the mode of operation they are responding to.

3.02 SEQUENCE OF OPERATION - KITCHEN EXHAUST AND MAKE UP AIR UNIT

- A. KX fan shall be automatically activated via room temperature sensor offset. If exhaust duct sensor detects a temperature rise of 5 degrees F (adj.) over the kitchen space temperature, the fans shall automatically turn on at low CFM.
- B. As exhaust duct sensor detects a temperature rise of 15 degrees F (adj.) over the kitchen space temperature, the supply fan (MA) shall automatically turn on. KX and MAU shall modulate based on duct temperature (cooking load).

- C. As the exhaust duct sensor detects a temperature drop below the activation point minus the temperature hysteresis of 2 degrees F (adj.) for all hoods specified, KX shall operate at low CFM and MAU shall be off.
- D. KX shall turn off when the duct temperature for the indidual fan specified remains below the activation point and the hysteresis timer has expired or the fan button is pressed.
- E. KX & MAU shall be capable of being placed at full speed manually.
- F. Kitchen Hood lights shall be capable of being turned ON and OFF manually via the light switch mounted on the hood.
- G. KX shall be on during fire.
- H. Light shall be on off during fire.
- 3.03 SEQUENCE OF OPERATION APPARATUS BAY EXHAUST FAN, GXF-1, GXF-2
 - A. Provide a 30 minute spring timer, thermostat and gas detection system to serve
 - B. Operation
 - 1. Off: Fans with associated motorized dampers shall be off and both app bay intake motorized dampers sleeved in louver assembly shall be closed.
 - 2. On: Apparatus Bay intake motorized dampers in louver assembly shall open, the fans shall operate and both associated motorized dampers shall be open.
 - 3. Timer: Both apparatus bay intake motorized dampers sleeved in louver assembly shall open and the fan shall operate.
 - a. GX-2: Exhaust fan shall be enabled and associated motorized damper 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.
 - b. GX-1: Fan shall operate continuously and the associated motorized damper shall be powered open while system is on.

3.04 SEQUENCE OF OPERATION EXHAUST FAN, VX-1

- A. Refer to Specification Section 233418 Vehicle Exhaust System.
- 3.05 SEQUENCE OF OPERATION EXHAUST FAN GXF-3,4,5,8,9,10,11
 - A. General:
 - 1. The exhaust fan shall run according to a user definable time schedule via time clock.

3.06 SEQUENCE OF OPERATION EXHAUST FAN GXF-16

- A. General:
 - 1. The exhaust fan shall be controlled by manufacturer IAQ controller.

3.07 SEQUENCE OF OPERATION EXHAUST FAN, GXF-6

- A. General:
 - 1. The exhaust fan shall run when ether of the following conditions are met:
 - a. The HOA switch is set to Hand OR
 - b. The HOA switch is set to Auto AND the fan is set to run based on a user definable time schedule via time clock.

3.08 SEQUENCE OF OPERATION EXHAUST FAN GXF-12,13,14

A. General:

- 1. The fan shall be provided with a line voltage thermostat by Contract 'E'
- 2. The fan shall run upon a rise in space temperature above 90 degrees F (adj.).

3.09 SEQUENCE OF OPERATION EXHAUST FAN, GXF-7

- A. General:
 - 1. The exhaust fan shall run when the associated light switch is turned on.

3.10 SEQUENCE OF OPERATION - CEILING PROPELLER FANS, HVLS-1,2,3

- A. General:
 - 1. BAFCon control system shall automatically adjust fans based on temperature. Bacnet capable.

3.11 SEQUENCE OF OPERATION - DUCTLESS SPLIT SYSTEM

- A. General:
 - 1. The system shall be provided with a programable wall mounted digital thermostat. The wall mounted thermostat shall sense a space temperature and activate the ductless split system above the set point temperature of 70 degree F(adj.). This set point shall be maintained at all times.

3.12 SEQUENCE OF OPERATION - HEAT RECOVERY VRF SYSTEM

- A. General:
 - 1. Each indoor unit shall be provided with a programmable wall mounted digital thermostat.
 - 2. All VRF systems shall be integrated with AE-200 System controler.
- B. Each indoor unit shall run according to a user definable time schedule in the following modes:
 - 1. Occupied Mode: The unit shall maintain
 - a. A 75 degree F (adj.) cooling set point
 - b. A 70 degree F (adj.) heating set point
 - 2. Unoccupied Mode (night set back): The unit shall maintain
 - a. A 85 degree F (adj.) cooling set point
 - b. A 60 degree F (adj.) heating set point.

3.13 SEQUENCE OF OPERATION - GAS FIRED UNIT HEATERS GUH-1 TO 9

- A. General:
 - 1. The heater shall be provided with a 24V thermostat from the factory.
 - 2. The heater shall turn on upon a fall in space temperature below 65 deg F (adj.).
 - 3. The heaters shall only run if apparatus bay doors are proven closed.
- 3.14 SEQUENCE OF OPERATION ELECTRIC UNIT HEATER, ELECTRIC CABINET UNIT HEATER, ELECTRIC BASEBOARD HEATER, ELECTRIC WALL HEATER, AND ELECTRIC RADIANT HEATER
 - A. General:
 - 1. See schedule on plans for controls.
 - a. The heater shall be controlled by its respective remote thermostat
 - b. OR the heater shall be controlled by a shared thermostat with the associated VRF/RTU. Electric heater shall be stage 2 heat.

c. OR the heater shall be controlled by a unit mounted thermostat.

B. Heating:

1. The heating set point temperature shall be 68 degrees (adj). When the space temperature falls below the setpoint temperature, unit shall power on to maintain heating setpoint.

3.15 SEQUENCE OF OPERATION - DEDICATED OUTDOOR AIR UNIT DOAS-1

- A. General:
 - 1. The supply system is a 100% outside air system consisting of a 2-position outside air damper, filters, gas heating coil, dx coil, energy recovery wheel, supply fan and exhaust fan and space mounted programable thermostat.
- B. Run Conditions Scheduled:
 - 1. The unit shall run according to a user definable occupancy schedule (user adjustable for time of day, day of week and calander for vacation days and holidays) with adjustable time-out.
- C. Outside Air Damper:
 - 1. The outside air damper shall open anytime the unit runs and shall close anytime the unit stops. The supply fan shall start only after the damper status has proven the damper is open.
 - 2. The outside air damper shall close 4sec (adj.) after the supply fan stops.
 - 3. Alarms shall be provided as follows:
 - a. Outside Air Damper Failure: Commanded open, but the status is closed.
 - b. Outside Air Damper in Hand: Commanded closed, but the status is open.
- D. Supply Fan:
 - 1. The supply fan shall run anytime the unit is commanded to run. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime, unless shutdown on safeties.
 - 2. Durring occupied mode the supply fan shall run continuously.
 - 3. Durring unoccupied mode the supply fan shall modulate to maintain heating and cooling setpoints.
 - 4. Alarms shall be provided as follows:
 - a. Supply Fan Failure: Commanded on, but the status is off.
- E. Exhaust Fan:
 - 1. The exhaust fan shall run anytime the unit is commanded to run. To prevent short cycling, the exhaus fan shall have a user definable (adj.) minimum runtime, unless shutdown on safeties.
 - 2. Durring occupied mode the exhaust fan shall run continuously.
 - 3. Durring unoccupied mode the exhaust fan shall modulate to maintain heating and cooling setpoints.
 - 4. Alarms shall be provided as follows:
 - a. Exhaust Fan Failure: Commanded on, but the status is off.
- F. Supply air discharge temperature control:
 - 1. The controller shall monitor the supply air temperature and maintain Supply Air discharge temperatures of:
 - a. Occupied:
 - 1) Cooling: 75 degrees F (adj). and 50% RH.
 - 2) Heating: 75 degrees F (adj).
 - b. Unoccupied:
 - 1) Unit shall be off.

- G. Energy Recovery Wheel Constant Speed:
 - 1. The controller shall run the heat recovery wheel for energy recovery as follows.
- H. Heating Recovery Mode:
 - 1. The controller shall measure the zone temperature and run the energy recovery wheel to maintain a set point 2 degree F (adj.) greater than the zone heating set point. The energy recovery wheel shall run for heat recovery whenever:
 - a. Return air temperature is 5 degree F (adj.) or more above the outside air temperature
 - b. AND the zone temperature is below heating set point.
 - c. AND the supply fan is on.
- I. Cooling Recovery Mode:
 - 1. The controller shall measure the zone temperature and run the energy recovery wheel to maintain a set point 2 degree F (adj.) less than the zone cooling set point. The energy recovery wheel shall run for cool recovery whenever:
 - a. Exhaust air temperature is 5 degree F (adj.) or more below the outside air temperature.
 - b. AND the zone temperature is above cooling set point.
 - c. AND the supply fan is on.
- J. Periodic Self-Cleaning:
 - 1. The wheel shall run for 10 sec (adj.) every 4 hr (adj.) the unit runs.
- K. Gas Heating Stages:
 - 1. The controller shall measure the zone temperature and modulate the heating to maintain its heating set point.
 - 2. The heating shall be enabled whenever:
 - a. Outside air temperature is less than 65 degree F (adj.).
 - b. AND the zone temperature is below heating set point.
 - c. AND the supply fan status is on.
 - d. AND the cooling is not active.
- L. DX Cooling Stages:
 - 1. The controller shall measure the zone temperature and stage the cooling to maintain its cooling set point. 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.
 - 2. The heating shall be enabled whenever:
 - a. Outside air temperature is greater than 60 degree F (adj.).
 - b. AND the zone temperature is below heating set point.
 - c. AND the supply fan status is on.
 - d. AND the heating is not active.
- M. Hot Gas Reheat mode:
 - 1. When the supply fan is running and the unit is in cooling mode the system monitors the leaving air temperature.
 - 2. If the leaving air temperature is less than 72 deg F, then the hot gas reheat mode will be enabled.
 - 3. If the leaving air temperature is greater than 72 deg F, then the hot gas reheat mode will be disabled.
 - 4. Dehumidification:
 - a. If the leaving air temperature set point is acheived the controller will check leaving air humidity.

- b. If the leaving air humidity is 3% above the leaving air humidity set point, 50% RH, the digital compressor will ramp up in capacity as necessary to satisfy the leaving air humidity set point.
- c. If the leaving air temperature goes below the set point, modulating hot gas reheat will be enabled to maintain the leaving air temperature. The controller will balance the capacity of the compressor and the use of hot gas reheat to first satisfy leaving air temperature and then, if necessary dehumidify.
- N. Prefilter Status:
 - 1. The controller shall monitor the prefilter status.
 - 2. Alarms shall be provided as follows:
 - a. Prefilter Change Required: Prefilter differential pressure exceeds a user definable limit (adj.).
- O. 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 degree F (adj.).
 - b. Low Supply Air Temp: If the supply air temperature is less than 45 degree F (adj.).
- P. Safeties and Alarms:
 - 1. Fire Alarm System shall stop all associated fans and close associated dampers upon a fire alarm condition.

3.16 SEQUENCE OF OPERATION - PACKAGED ROOFTOP UNIT, RTU-A RTU-B

- 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
 - b. A 75 degree F (adj.) cooling set point
 - c. A 70 degree F (adj.) heating set point.
 - 1) Unoccupied Mode (night setback): The unit shall maintain
 - (a) A 85 degree F (adj.) cooling set point.
 - (b) A 60 degree F (adj.) heating set point.
 - 2. Alarms shall be provided as follows:
 - a. High Zone Temp: If the zone temperature is greater than the cooling set point by a user definable amount (adj.).
 - b. Low Zone Temp: If the zone temperature is less than the heating set point by a user definable amount (adj.).
- B. Zone Set Point, if applicable:
 - 1. The BMS shall determine the zone setpoint based on schedule and occupancy status.
 - 2. The BMS shall poll each zone temperature sensor to determine the lowest zone temperature.
 - 3. The BMS shall command the RTU to modulate heating or cooling capacity as necessary to maintain the minimum zone temperature.
- C. Zone Set point Adjust:
 - 1. The occupant shall be able to adjust the zone temperature heating and cooling set points at the zone sensor.
- D. 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.
- 2. Alarms shall be provided as follows:
 - a. Supply Fan Failure: Commanded on, but the status is off.
- E. 100% Power Exhaust Fan:
 - The power exhaust fan shall run under the following conditions:
 - a. The outside air damper status is open (by any non-zero percent).b. AND the supply fan status is on.
 - The power exhaust fan shall modulate as required based on the position of the outside air damper to exhaust an equal ammout of outside air entering the spaces served by the RTU's.
 - To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
 - 4. Alarms shall be provided as follows:
 - a. Supply Fan Failure: Commanded on, but the status is off.
- F. Cooling Stages:

1

- 1. The controller shall measure the zone temperature and stage the cooling to maintain its cooling set point. 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.
- 2. The cooling shall be enabled whenever:
 - a. Outside air temperature is greater than 60 degree F (adj.).
 - b. AND the economizer (if present) is disabled or fully open.
 - c. AND the zone temperature is above cooling set point.
 - d. AND the supply fan status is on.
 - e. AND the heating is not active.
- G. Heating:
 - 1. The controller shall measure the zone temperatures and modulate the control vlave to maintain its heating set point.
 - a. If heating is required, the supply air temperature setpoint shall be reset for heating as follows:
 - 1) The supply air temperature set point shall be 52 deg F (adj).
 - 2. The heating shall be enabled whenever:
 - a. Outside air temperature is less than 65 degree F (adj.).
 - b. AND the zone temperature is below heating set point.
 - c. AND the supply fan status is on.
 - d. AND the cooling is not active.
 - 3. Freeze Condition:
 - a. In the event the Freeze-stat is activated (set at 40 deg F, adjustable) the following shall occur:
 - 1) The outside air damper shall fully close.
 - 2) The hot water control valve shall open 100%
 - 3) The supply air fan shall turn off.
 - 4) An alarm shall be generated.
- H. Economizer:
 - The controller shall measure the zone temperature and modulate the economizer dampers in sequence and call for the power exhaust fan to operate at 100% to maintain a set point 2 degree F less than the zone cooling set point. 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 degree F (adj.).

- b. AND the outside air enthalpy is less than 22% (adj.).
- c. AND the outside air temperature is less than the return air temperature.
- d. AND the outside air enthalpy is less than the return air enthalpy.
- e. AND the supply fan status is on.
- f. AND the power exhaust fan status is on.
- 3. The economizer shall close whenever:
 - a. Mixed air temperature drops from 45 degree F to 40 degree F (adj.).
 - b. OR on loss of supply fan status.
 - c. OR on loss of power exhaust fan status.
 - d. OR Freezestat (if present) is on.
- 4. The outside 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.
- I. 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.
- J. 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.). Dehumidification shall be enabled whenever the supply fan status is on.
- K. Prefilter Status:
 - 1. The controller shall monitor the prefilter status.
 - 2. Alarms shall be provided as follows:
 - a. Prefilter Change Required: Prefilter differential pressure exceeds a user definable limit (adj.).
- L. Mixed Air Temperature:
 - 1. The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).
 - 2. Alarms shall be provided as follows:
 - a. High Mixed Air Temp: If the mixed air temperature is greater than 90 degree F (adj.).
 - b. Low Mixed Air Temp: If the mixed air temperature is less than 45 degree F (adj.).
- M. Return Air Humidity:
 - 1. The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).
 - 2. Alarms shall be provided as follows:
 - a. High Return Air Humidity: If the return air humidity is greater than 70% (adj.).
 - b. Low Return Air Humidity: If the return air humidity is less than 35% (adj.).
- N. Return Air Temperature:
 - 1. The controller shall monitor the return air temperature and use as required for economizer control (if present).
 - 2. Alarms shall be provided as follows:
 - a. High Return Air Temp: If the return air temperature is greater than 90 degree F adj.).
 - b. Low Return Air Temp: If the return air temperature is less than 45 degree F (adj.).
- O. 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 degree F (adj.).

- b. Low Supply Air Temp: If the supply air temperature is less than 45 degree F (adj.).
- P. Outside Air Damper Control:
 - 1. A one-time measurement of the outdoor air CO2 concentration shall be performed at the building site. This value shall serve as the minimum CO2 Concentration (C-s-min). Programmed value shall not exceed 350 PPM.
 - 2. During all occupied modes the outside air damper shall be controlled to the effective minimum airflow operator adjustable, unless the economizing mode or mixed air temperature control routines are active. The outside air damper shall be closed during the Unoccupied mode, morning warm-up and pre-cool modes or when the outside air temperature falls below a Low Ambient Damper Lockout Set point (operator adjustable).
 - 3. The AHU outdoor-air damper shall be controlled to deliver required outdoor airflow at all load conditions. The actual outdoor airflow shall be sensed at the outdoor air intake via an airflow measuring station.
 - 4. During all occupied modes and when the fan is running, the controller shall reset the outdoor air ventilation setpoint from its minimum to maximum, in direct response to the highest individual hardwired CO2 level in the space, regulating the amount of fresh air allowed to enter the space. The CO2 room sensor shall calculate a level of concentration, to be used in the control loop. The ventilation setpoint shall increase as CO2 level rises above the Minimum CO2 Level Setpoint (operator adjustable) noted as "Minimum CO2 Concentration (Cs-min)" on the Demand Controlled Ventilation schedule located on the drawings. The outdoor air ventilation setpoint shall be at maximum when the CO2 level reaches the Maximum CO2 Threshold (operator adjustable) noted as "Design CO2 Concentration (Cs-design)" on the Demand Controlled ventilation schedule located on the drawings. Design airflows and CO2 concentrations are located on the drawings schedule sheet.

Demand Control Ventilation Schedule

| Minimum CO2 Concentration (Cs-min) | Outdoor Airflow at Minimum CO2 Concentration (Vot-min) | Design CO2 Concentration (Cs-design) | Outdoor Airflow at Design CO2 Concentration (Vot-design) |
|--|---|--|---|
| One-time field measurement | 20% of Vot-design | Cs-min + PPM | Max OA |
| RTU-A RTU-B | 150 335 | Cs-min + 700PPM Cs-min + 700PPM | 745 1675 |

5. Outside air airflow setpoint shall reset the Supply fan VFD minimum speed setpoint, to assure adequate ventilation.

END OF SECTION

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 D1784 Rigid Vinyl Compounds.
- C. ASTM D1785 PVC Plastic Pipe, Schedule 40
- D. ASTM D2466 PVC Plastic Fittings, Schedule 40
- E. ASTM D2665 PVC Drain, Waste, and Vent Pipe and Fittings
- F. ASTM D2564 Solvent Cements for PVC Pipe and Fittings
- G. ASTM D2321 Underground Installation of Thermoplastic Pipe (non-pressure applications)
- H. ASTM F1668 Procedures for Buried Plastic Pipe
- I. ASTM F1866 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.

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 083100 Access Doors and Panels.
- 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 ¼ 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

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 (Inches) | ROD DIAMETER (Inches) | MAXIMUM SPACING (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 no 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

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 Systems

1.03 REFERENCES

- A. ASHRAE Handbook Fundamentals; Latest Edition.
- B. SMACNA HVAC Duct Construction Standards Metal And Flexible (latest issue)
- C. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- D. ASTM B209 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. Blank off panels
 - 9. 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 A653.

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 then 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.

- 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 SMOKE DAMPERS

- A. Fabricate and install in accordance with NFPA 90A and UL Safety Standard 555S, and AMCA Standard 500.
- B. Leakage Class: Leakage Class II per UL 555S
- C. Pressure Differential Rating: 4 In. w. g.
- D. Air Flow Velocity: 2000 fpm
- E. Elevated Temperature Rating: 350 Deg. F per UL555S
- F. Fabricate smoke dampers with 16 gage galvanized steel frame and blades, sintered bronze sleeve type bearings rotating in polished extruded holes in the damper frame, 1/2 inch dia. (minimum) plated steel axles, linkage concealed in the jamb, stainless steel blade stops, silicone rubber blade edge seals, and stainless steel compression type jamb seals.
- G. Actuators: 24 VDC, 2-position, external mounting

- 1. Greenheck Model SMD-200 and SMD-300.
- 2. Ruskin Mfr. Co.
- 3. Arrow Damper & Louver.
- 4. Imperial Damper Co.

2.11 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.

2.12 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. Single-Wall Grease Duct shall be installed in accordance with the manufacturer's "Installation, Operation and Maintenance Manual", ETL listing and state and local codes.
- G. Grease duct installed outside of the building shall be protected against accidental damage or vandalism.
- H. 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.
- I. Fans shall be supported independently from the grease duct sections. Protect grease duct from twisting or movement caused by fan torque or vibration.
- J. 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.

2.13 KITCHEN EXHAUST DUCTWORK (BLACK IRON)

- A. All longitudinal seams shall be continuously welded. Transverse joints made in the shop shall also be made with a continuous weld. Kitchen range exhaust ducts shall be constructed of and supported as follows:
 - 1. Ducts with a cross-sectional area up to and including 155 square inches shall be No. 16 gauge black iron.
 - 2. Ducts with a cross-sectional area over 155 square inches but less than 200 square inches shall be No. 14 gauge black iron.
 - 3. Ducts with a cross-sectional area equal to or greater than 200 square inches shall be No. 12 gauge black iron.
- B. Ducts shall be installed without forming dips or traps.
- C. Overlapping duct connections of either the telescoping or the bell type shall be used for welded field joints, not butt-weld connections. The inside duct section shall always be uphill of the outside duct section. The difference between inside dimensions of overlapping sections shall not exceed 1/4 in. The overlap shall not exceed 2 in.
- D. For cleanout access doors requirements see the Ductwork Insulation Section.
- E. All elbows shall be radius type with centerline radius to 1-1/4 times the duct width.

- F. Locate the ductwork with the minimum clearances to combustible material required by NFPA 96 Chapter 4, Duct systems.
- G. Exhaust fans with ductwork connected to both sides shall have access doors for cleaning and inspection within 3 ft of each side of the fan.
- H. Openings shall be provided at the sides or at the top of the duct, whichever is more accessible, and at changes of direction.
- I. On horizontal ducts at least one 20 in. by 20 in. opening shall be provided for personnel entry. Horizontal ducting shall be secured sufficiently to allow for the weight of personnel entry into the duct. Where an opening of this size is not possible, openings large enough to permit thorough cleaning shall be provided at 12-ft intervals.
- J. 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.

2.14 STAINLESS STEEL DUCTWORK

- A. Fabricate ducts serving dishwasher hoods of minimum 20 gauge AISI Type 302 or 304 stainless steel sheet metal.
- B. Fabricate ducts serving laboratory exhaust fume hoods of minimum 20 gauge AISI Type 316 stainless steel sheet metal.
- C. Use stainless steel with a No. 4 finish where installed exposed in finished rooms and No. 2B finish in other locations. Use stainless steel fasteners for ductwork installed exposed in finished rooms and where fastener penetrates duct. Galvanized fasteners may be used in unfinished spaces for non-penetrating service.
- D. Use stainless steel reinforcing members for ducts in finished spaces and galvanized steel in unfinished spaces.
- E. Longitudinal Seams For Dishwashing, and Other Scullery Equipment Exhaust Ducts: Form double corner seams, or Pittsburgh lock seams.
 - 1. Fabricate elbows and transitions with Pittsburgh lock seams.
 - 2. Fabricate double compounded elbows and other complex fittings with double corner seams.
 - 3. Locate seams in horizontal ducts at top corners of ducts, unless otherwise approved in writing.
 - 4. Locate seams in vertical ducts at rear corners of ducts.
- F. Construct ductwork as per "GALVANIZED STEEL RECTANGULAR DUCTS AND FITTINGS" section above unless otherwise noted in this section.
- G. At dishwasher locations, pitch horizontal ductwork minimum ¼ inch per foot such that low point is at the dishwasher.

2.15 ALUMINUM DUCTWORK

- A. Construct ducts of minimum No. 20 gauge aluminum sheet meeting ASTM B209, 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 ¹/₄ inch per foot such that low point is at shower room.

2.16 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.

2.17 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.

2.18 HEAVY DUTY FLEXIBLE CONNECTIONS

- A. Heavy Duty Flexible Connections shall be used in high pressure (greater than 2 in. w.c.), high temperature (greater than 150 degree F) air applications or where the gas is highly corrosive and the duct connector must be leak proof.
- B. Flexible Connectors shall be flanged. If installed outdoors, all metallic components shall be stainless steel construction. Provide flexible connector materials of construction as recommended by the manufacturer for the pressure, temperature, and gas that is being used in air handler system.

- C. Approved Manufacturers:
 - 1. Mercer Rubber Company

2.19 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 times 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.
- L. Provide flexible duct supports at all elbows and changes in direction that maybe subject to restriction, collapsing, or pinching to mitigate chance of reduction in cross section area, flow velocities and noise. Duct support shall be minimum radius = duct diameter, nylon polymer construction, with nylon straps. Malco FDS1 or equal.

2.20 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.
- 2.21 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 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 no pass down through the opening.
- G. Fasten plenums and casings connected to concrete curbs using continuous 1 ½ inch by 1 ½ inch by 1¼ 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 ±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 Diameter or Equivalent | *A/100 ft. Run |
|---|----------------|
| 12 inches or less | 10 |
| 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.

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

| AIR SYSTEM | DUCTWORK MATERIAL |
|--|---------------------------------|
| Supply, Outside Air & Exhaust Ductwork | Galvanized Steel |
| Kitchen Exhaust | Black Iron |
| Shower Room Exhaust | Aluminum |
| Ductwork Exposed to Weather | Aluminum |
| Dishwasher Hood Exhaust | Type 302 or 304 Stainless Steel |
| Laboratory Exhaust Fume Hood | Type 316 Stainless Steel |
| Clothes Dryer Exhaust | Rigid Metal |

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide exhaust fans, as specified herein, with accessories and of sizes and capacities as noted here-in, and as scheduled and in locations shown on drawings.
- B. Products listed in Part 2 of this Section include:
 - 1. Centrifugal Up / Down Blast Fans
 - 2. Dryer Exhaust Fans
 - 3. Centrifugal In Line Fans
 - 4. Utility Set Fans
 - 5. Ceiling Exhaust Fans
 - 6. High Plume Dilution Fans

1.02 ACCESSORIES:

- A. Provide accessories as scheduled. Refer to controls diagrams and specifications, sequence of operations specifications and electrical drawings for detailed requirements.
 - 1. Back draft dampers
 - 2. Motorized dampers with appropriately sized actuators
 - 3. Motor speed controls, interlock and control and monitoring devices
 - 4. Disconnect switches
 - 5. Roof curbs
 - 6. Curb Adapters
 - 7. Wind or Seismic restrains, guy wires, etc.

1.03 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
- F. Section 230991: Instrumentation and Controls Integration
- G. Section 230993: Sequence of Operations

1.04 REFERENCE CODES AND STANDARDS

- A. AMCA 99 Standards Handbook
- B. AMCA 210 Laboratory Methods of Testing Fans for Rating
- C. AMCA 260 Performance of Induced Flow for High Plume Dilution Fans
- D. AMCA 300 Reverberant Room Method for Sound Testing of Fans
- E. ASHRAE Handbook, HVAC Applications Volume "Sound and Vibration Control"
- F. UL listed and labeled.

1.05 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.

1.06 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 and 300. 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 UP/DOWNBLAST FANS

- A. Roof mounted exhaust fans shall be of the up or down blast direct drive type, as scheduled.
- B. The fan housing shall 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. Upblast fans for use with kitchen exhaust or grease laden air shall be provided with a grease drain, grease cup and inspection and clean out access doors.
- E. 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.
- F. A NEMA 1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.
- G. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.
- H. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
- I. Fans shall be manufactured by Greenheck or approved equal.

2.02 DIRECT DRIVEN CENTRIFUGAL IN-LINE EXHAUST FANS

- A. General Description:
 - 1. Base fan performance at standard conditions (density 0.075 Lb/ft3)
 - 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 manufacture'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.

2.03 DIRECT DRIVE BACKWARD INCLINED UTILITY SET FANS

- A. General Description:
 - 1. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.
 - 2. Fan type in AMCA Arrangement 4 with a single width and single inlet housing.
- B. Wheel:
 - 1. Non-overloading, backward inclined centrifugal wheel.
 - 2. Clockwise rotation.
 - 3. Constructed of aluminum
 - 4. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 - 5. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
 - 6. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone.

C. Motors:

- 1. Motor enclosures: Open type
- 2. Motor to be a DC electronic commutation type motor (ECM) specifically designed for
- 3. fan applications. AC induction type motors are not acceptable. Examples of
- 4. unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split
- 5. Phase, Capacitor Start and 3 phase induction type motors.
- 6. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan
- 7. load and pre-wired to the specific voltage and phase.

- 8. Internal motor circuitry to convert AC power supplied to the fan to DC power to
- 9. operate the motor.
- 10. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed
- 11. shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10
- 12. VDC signal.
- 13. Motor shall be a minimum of 85% efficient at all speeds.
- D. Housing:
 - 1. Discharge position: TH
 - 2. Constructed of painted steel with air tight lock formed seams
 - 3. Shall be easily rotated in the field to any of the eight standard discharge positions
 - 4. Fans for use with kitchen exhaust or grease laden air shall be provided with a grease drain, grease cup and inspection and clean out access doors.
- E. Housing Supports and Drive Frame:
 - 1. Housing supports are constructed of heavy gauge galvanized or painted steel with formed flanges
 - 2. Drive frame is constructed of heavy gauge galvanized or painted steel to support the motor and provide reinforcement for the housing
 - 3. Prepunched mounting holes for installation
- F. Disconnect Switches:
 - 1. NEMA rated: 4X
 - 2. Positive electrical shut-off
 - 3. Wired from fan motor to junction box

G. Options/Accessories:

- 1. Access Door:
 - a. Type: Bolted
 - b. Provides access for inspection and cleaning of wheel
- 2. Finishes:
 - a. Types: Hi-Pro Polyester
- 3. Shaft Seal:
 - a. Shaft seal is on aluminum rub ring which seals around the shaft
- 4. Isolation:
 - a. Type: Spring Base Mounting Rails
 - b. Sized to match the weight of each fan
- 5. Weatherhood:
 - a. Completely covers motor and drive compartments
 - b. Vented to provide sufficient motor cooling
 - c. Required to meet UL 705

2.04 CEILING EXHAUST FANS

- A. Ceiling mounted exhaust fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be lined with 0.5 in. acoustical insulation. The outlet duct collar shall include an aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge.
- B. The grille shall be constructed of high impact polystyrene. Grilles shall be non-yellowing.
- C. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators. The fan wheel(s) shall be of the forward curved centrifugal type, constructed of galvanized steel and dynamically balanced.

- D. All fans shall be licensed to bear the AMCA Certified Ratings Seals for sound and air performance and shall be U.L. Listed and C.S.A. approved.
- E. Ceiling exhaust fans shall be Model SP 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 supply / exhaust fans and dampers are properly interlocked, operate with control system as required to maintain building pressurization and exhaust per design documents and for proper building operation.
- D. Provide all associated start-up and testing reports.
- E. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Installation of a magnetic type source capture exhaust removal systems. Refer to plans for quantity of emergency response vehicles served by each system. These specifications outline the scope of work and minimum requirements for the complete installation of a vehicle exhaust removal system for the District. Any exceptions, no matter how slight, shall note in the bid stating "alternate being proposed". The bidder shall take full responsibility for any additional costs an alternate system may present. Bidders are required to provide whatever documentation with their bid pertaining to any exceptions taken for the District to evaluate. This information must include the make and model of equipment proposed. It will be used to determine equivalents to the specifications. Failure to provide such documentation may be cause for rejection of bid. The Owner reserves the right to accept or reject any or all bids if it is in the best interest of the fire department.
- B. The system(s) installed shall be suitable for a total of Seven (7) apparatus bays at the Headquarters Building and a total of _____ apparatus bays at _____. Each bay shall utilize a rail system that accommodates vehicles parked in tandem. Refer to drawings for quantity of vehicles parked in tandem at each bay location.

1.02 SECTION INCLUDES

- A. Straight rail systems.
- B. Ductwork.
- C. Exhaust fans.
- D. Controllers.

1.03 REFERENCES

- A. National Fire Protection Association (NFPA)
- B. Air Movement and Control Association (AMCA)
- C. International Mechanical Code (IMC)
- D. American National Standards Institute (ANSI)
- E. American Society of Mechanical Engineers (ASME)
- F. National Electric Code (NEC)
- G. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- H. Underwriters Laboratory (UL)

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions, sizes, weights and point loadings, locations and sizes of field connections, and details on wall and roof penetrations.

- C. Product Data: Provide manufacturers literature and data sheets indicating rated capacities, dimensions, weights and point loadings, accessories, electrical characteristics and connection requirements, wiring diagrams, and location and sizes of field connections.
- D. Provide fan curves with specified operating point clearly plotted.
- E. Submit sound power levels for both fan inlet and outlet at rated capacity.
- F. Manufacturer's Installation Instructions: Indicate assembly and installation instructions.
- G. Manufacturer's Warranty.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Sections 017820 and 017823.
- B. Operation and Maintenance Data: Include instructions for fan lubrication, motor and drive replacement, spare parts list, automatic start and automatic disconnect systems, and wiring diagrams.

1.06 QUALITY ASSURANCE

- A. Fans
 - 1. Performance Ratings: Conform to AMCA 210.
 - 2. Sound Ratings: AMCA 301, tested to AMCA 300 shall not exceed 64 dB at 25 feet radius of unit.
 - 3. Fabrication: Conform to AMCA 99.
- B. All major components shall be ISO 9001 certified.
- C. Electrical controllers shall be UL listed.

1.07 WARRANTY

- A. The vehicle exhaust system and component parts shall be warranted to be free from defects in material and workmanship for a period of two (2) years. A copy of the equipment manufacturer's warranty must be submitted with the shop drawings.
- B. Contractor/vendor shall provide annual inspection of the system for a period of two (2) years. Copy of the inspection report shall be supplied to the chief of the department and shall include any repairs or adjustments made.

1.08 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.01 STRAIGHT RAIL SYSTEM

A. Shall be delivered and installed as a magnetic straight rail system. The system shall be designed for vehicles with under carriage exhaust tailpipe configurations. System shall be capable of handling up to four apparatus per bay in tandem arrangement allowing the operator to attach the system at the vehicle entrance and reach its designated rest position. The basis of

design is as manufactured by PlymoVent Corporation or as an equal to the specifications to follow.

- B. Operating Logic
 - 1. The operating logic of this system shall complete the following cycle. Upon the vehicles return to the apparatus floor of the fire station, a 5" dia. exhaust ventilation hose equipped with a magnetically controlled grabber nozzle shall be attached to vehicles exhaust tailpipe at the door opening. The method of securing the system to the vehicle shall be achieved via magnetic cuff. The design shall ensure virtually 100% source capture of the exhaust fumes at the tailpipe. Once the system has been secured to the vehicle's tailpipe, the exhaust fan shall automatically and instantaneously be energized by the output pressure of exhaust from any motor vehicle to assure total collection of exhaust gases. The vehicle can now be positioned (backed in) in its designated parking position and the hose will follow.
 - 2. Upon emergency dispatch of the vehicle, the output pressure generated by any internal combustion engine shall again automatically energize the exhaust fan. As the vehicle leaves the apparatus floor, the flexible hose with grabber nozzle shall travel along the rail and trolley system with the vehicle as it exits the station. The nozzle shall disconnect automatically and smoothly from the vehicle at a preset distance from the exiting door. The exhaust fan shall continue to run to evacuate the exhaust from the duct system and then shut down automatically.
- C. Suction Rail Profile
 - Shall be one piece continuous round profile equivalent to 6" round duct, with no splices, extruded profile in a minimum length of 19 feet. Construction shall serve as both a ducting system and trolley transport compartment. Rail diameter shall be equivalent to 6" round duct and a minimum gauge thickness 0.175". The bottom of rail profile will have a continuous slot that will accept specially designed rubber sealing lips designed to seal the underside of the rail profile under negative suction.
- D. Rail Material
 - 1. Shall be aircraft aluminum alloy type AA-06063. Rail shall be extruded as a one piece unit in a minimum of 19' lengths.
- E. Vertical Support/Bracing
 - Shall be provided to securely mount entire length of rail profile to building structure. Support legs shall be provided for every 10' of rail length. Supports shall be constructed of Aluminum alloy type AA-6063 to provide strength and keep total system weight to a minimum. Leg supports shall be a one piece construction and meet a minimum seismic 4 requirement. All leg supports shall have side bracing constructed from tubular zinc plated steel to provide stabilization of track system. Angle shall be completely adjustable to the leg support and mounted perpendicular to direction of track. Typical support angle shall be 45 degrees from center line of support.
- F. Rail Splicing Joint
 - Shall be formed by an extrusion equal to the internal diameter of suction rail profile. Splice shall be internally located and cover no less then half the circumference of the rail profile. Rail splicing shall be safely secured by no less than 16 (Qty) 1 1/4" x 3/8" bolts, nuts and lock washers. Each of which shall pass directly through exterior rail profile / splicing joint and be secured with internal locking washer and nut. Self tapping bolts/screws shall not be acceptable.
- G. Middle Rail Duct Connection
 - 1. Shall be rectangular to 6 inch diameter round transition fitting fabricated from 20 gauge galvanized steel. Rectangular slot shall be 19 inches long by 1 3/4 inches high with 3/8 inch external flange to slide into rail profile.

- H. Suction Trolley Assembly
 - 1. The trolley assembly shall be designed to transport the flexible hose assembly along with the vehicle as it enters and exits the station. The trolley shall be supported internal of the rail profile. The trolley shall utilize sealed bearing loaded wheels formed to fit the internal rail profile to support the trolley chassis and hose assembly. The trolley chase shall be aluminum powder coated black finish. The chassis shall be fitted with a tapered cone equal to in size or exceeds in area (sq. inches) the diameter of the exhaust ventilation hose which it is attached to. The trolley assembly shall be equipped with rubber impact bumpers at both front and rear of chassis to eliminate metal to metal contact which would destroy or damage trolley assemblies.
- I. Emergency Automatic Disconnect
 - 1. Shall be provided to enable the vehicle to back off the system through a rear exit door or when it may become necessary to depart from the normal path of exit, in the event of a malfunctioning of the over-head door which commonly allows exit of vehicles from station or if the front line responding vehicle in a series of two, malfunctions impeding the normal exit of the second vehicle.
- J. Upper Hose Assembly
 - The upper hose shall be 5 inches in diameter and manufactured for the sole purpose of venting high temperature exhaust gases, which are produced by internal combustion engines. Flexible hose shall be rated for 900 degrees (F) continuous, 1050 degrees (F) intermittent temperatures. The outside of the exhaust hose shall have a protective lamination the entire length of the hose to protect fire apparatus in the event vehicle and hose come in contact with each other.
- K. Lower Hose Assembly
 - 1. Shall be a rigid 2 foot long section of hose identical in characteristics to the upper hose assembly. Lower hose shall support connection nozzle and reducing elbow in a rigid fashion as to allow for operator to place hose collection device onto tailpipe without bending. Lower hose is the only section of hose which shall release in the event of safety disconnect.
- L. Safety Handle Disconnect Coupling
 - 1. Incorporated in the design of the system shall be a safety breakaway device enabling a physical disconnect between the exhaust system and the vehicle in the event of system malfunction or human error. The device shall incorporate a handle for attaching the system to the vehicle without bending over. The coupling shall enable the lower two foot hose assembly to freely rotate 360 degrees. The device shall utilize a quick connect fitting so the lower hose can be snapped back into place without the use of any tools. The quick connect shall allow the lower hose to be manually disconnected and relocated to any other system should the vehicle be relocated. The device shall be reusable and have an adjustable release tension.
- M. Hose Suspension Saddle
 - 1. The hose saddle shall be fabricated of steel with a heat resistant protective paint. The saddle shall support the hose and serve as the stress point during the system release. The design of saddle shall join two sections of hose together at its midpoint intersection and provide a smooth 93 degree transition.
- N. Magnetic Nozzle and Transition Elbow
 - 1. The nozzle attachment shall be designed to mate up with the vehicle tailpipe in such a manor to prevent the operator from having to bend over to attach the nozzle.
 - 2. The nozzle shall allow a sealed connection to the end of the tailpipe which is to be outfitted with a conical male adaptor designed for mating up with the nozzle. The nozzle shall be

fabricated from zinc plated steel or stainless steel. The nozzle shall have the ability to add or subtract magnets from the nozzle thereby providing an adjustment capability for magnetic hold strength to the tailpipe conical adaptor. The manufacture shall offer the nozzle and tailpipe adaptor in 3", 3.5", 4", 5", & 6", & 7" diameters to accommodate all tailpipe diameters and configurations.

- 3. To ensure there is no leakage of exhaust, the magnetic connection shall be accomplished in such a manner that there is no gap between the vehicle tailpipe termination point and the nozzle connection to the tailpipe. The earth magnets shall be adjustable and easily removable for replacement. They shall be positioned to hold the nozzle connection to the tailpipe while the vehicle is entering and exiting the station without releasing. The nozzle shall incorporate a debris screen to prevent foreign objects from entering the system and a 67 degree transition to direct the exhaust gasses up the hose. The exterior of the nozzle shall be chrome plate for corrosion resistance and aesthetics.
- 4. The nozzle attachment shall be designed to mate up with the vehicle tailpipe in such a manor to allow a sealed connection to the end of the tailpipe while also inducing ambient air through a specialized tailpipe adaptor installed on the vehicle. The manufacturer shall offer the nozzle and tailpipe adaptor in 3", 3.5", 4", 5", 6", & 7" diameters to accommodate all tailpipe diameters and configurations.
- O. Vehicle Tailpipe Configuration
 - 1. Tailpipes shall be at a 90° angle (perpendicular to apparatus) on passenger side of vehicle and shall not extend out any further than the apparatus body. There shall be a minimum clearance of 4 inches from the top of the pipe to the apparatus body. Tail pipes at a 45° angle of departure shall not be acceptable since exhaust blow back into station after the system release will be uncontrollable. All tailpipes shall be modified by the owner.
- P. Safety Features
 - 1. The system shall be designed and capable of capturing virtually 100% of the exhaust gas and particulate at the tailpipe. The system shall not detach itself from the apparatus during power failure.
 - 2. A balancer shall be used to keep the hose off the floor and away from the vehicle. It shall be a self-adjusting weight balancer and provide a constant lifting force without locking in an extended position. Balancer shall have a stainless steel cable for the purpose of retracting the hose away from the vehicle upon release.

2.02 EXHAUST FAN

- A. The blower unit shall be a AMCA type B, direct drive spark resistant blower capable of delivering 500 CFM per vehicle. Exhaust fan shall be tested in accordance to AMCA standard # 210 in an AMCA approved test facility.
- B. Fan Housing and Impeller
 - 1. The housing shall be of one piece construction fabricated from galvanized steel with epoxy powder coat paint inside and out. The design shall allow the user to remove the fan motor and impeller without removing the inlet or outlet duct connections. The impeller shall be fabricated from aluminum and be designed as a radial blade backward incline type wheel.
- C. Fan Motor
 - 1. Shall be UL listed and manufactured by a readily available nationally recognized motor manufacturer and meet EPAC standards.
- D. Exhaust Blower
 - 1. Shall provide a minimum of 500 CFM per vehicle at the properly calculated pressure loss of the system design.
- E. Motor Type

- 1. Shall be a totally enclosed fan cooled or ventilated type with a readily available NEMA frame from 5 6 145 T.
- F. Motor Bearings
 - 1. Shall be a totally enclosed self lubricated type.
- G. Vibration Isolating
 - 1. Fan shall be manufactured as a complete assembly to assure the least possible vibration or movement. Fan wheel shall be both statically and dynamically balanced.

2.03 DUCTWORK

- A. SMACNA class I conveying and must meet or exceed criteria for construction and performance as outlined in Round Industrial Duct Construction Standards for the designed operating pressure.
- B. Materials of Construction
 - 1. Materials of construction, unless otherwise specified, for all duct and fittings shall be minimum G-30 galvanized sheet metal in accordance with ASTM A525 and ASTM A527.
- C. Duct Size
 - 1. All duct subject to positive or negative pressure shall be of round spiral pipe construction, with the range of available sizes not to exceed 14 inches in diameter.
- D. Duct Gauge
 - 1. Duct gauge shall depend on diameter and a minimum operating pressure. Acceptable gauge and reinforcement requirements shall be in accordance with SMACNA guidelines. Bidder shall document their designed operating pressure on their design submission.
- E. Duct Length
 - 1. Duct shall be provided in 10 foot continuous lengths wherever possible. Except when interrupted by fittings, round spiral duct section shall not be less than 10 feet long.
- F. Exhaust Fittings
 - 1. All exhaust fittings shall be round and have a wall thickness two (2) gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected. Branch entrances shall be factory fabricated fittings or factory fabricated duct/tap assemblies. Fittings shall be constructed so that air streams converge at angles of 45°.
- G. Standard Welded Seams
 - 1. Standard seam joints shall be continuous welded on all fittings. All welded joints shall be coated with a protective paint, inside and out to prevent damage to galvanized surface.
- H. Turning Elbows
 - 1. Shall be die stamped and used for all diameters and pressures.
- I. Tapered Body Fittings
 - 1. Shall be used wherever particular fallout is anticipated, and where air flow is introduced to the transport duct manifold.
- J. Exhaust Joint Construction
 - 1. All joint connections which are not continuous welded shall be supplied with a transition coupling from the downstream end only. Coupling shall be fully welded and shall provide a fitting size projection to fit inside a downstream fitting or another duct section. Couplings shall have a two inch minimum insertion length and shall be two (2) gauge numbers (one

even gauge number) heavier than the duct to which they are connected. This along with a 600 high temperature silicone seal will constitute the primary mechanical seal.

- K. Duct Conveying Velocity
 - 1. Shall be a minimum of 2000 3000 feet / minute transport velocity per UMC code. No exceptions.
- L. Exhaust Rain Cap
 - 1. Shall be manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an intricate part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.
- M. Exhaust Duct Penetration
 - 1. In all cases when making a wall penetration it should be clearly indicated in the bid drawing and be accomplished via use of a professional core drilling machine if possible. The core drilling shall be properly sized to reduce the diameter to the smallest possible size.

2.04 CONTROLLER

- A. Shall be manufactured and delivered as an Operating System Three series controller(s), as manufactured by PlymoVent Corporation or as an equal to the specifications to follow.
- B. Controller Logic
 - 1. Shall be designed to sense the output pressure which is normally generated by any internal combustion engine designed to propel any motor vehicle. The operating logic shall be designed to complete this cycle, at any point in time, when a collection device is connected to a motor vehicle's exhaust tail pipe and at which time the vehicle is manually or automatically energized by the operator. The controller shall automatically sense the engine's output pressure and energize the electrical contactors which will provide proper full load amperage to the exhaust system motor. The controller, through the use of a three minute fixed timer, shall keep the contactors energized for the three minute minimum fixed time.
- C. Electrical controller shall be UL listed/approved and manufactured in accordance with Underwriters Laboratories standard UL-508 enclosed industrial control panels. The electrical trolley shall include a limited energy control circuit.
- D. Electrical Enclosure
 - 1. Shall be NEMA 12 rated and UL listed as Type 12.
- E. Enclosure Keylock
 - 1. Shall be provided and mounted in electrical enclosure to restrict access to internal components of controller by only authorized entry.
- F. Electrical Contactors
 - 1. Shall be Allen Bradley industrial electrical contactors provided with the appropriate adjustable overload relays to meet the proper full load amperage of motor it is designed to control. Contactor shall conform to the following standards: BS-5424, VDE0660, and be approved by UL Certification as an approved component.
- G. Control Transformer
 - 1. To be UL listed industrial control circuit transformer with primary and secondary fuse blocks. Transformer shall be provided with multitap primary 208V through 480V, AC, and 24V through 120V secondary.
- H. Electrical Timer

- 1. Shall be solid state, 3 minute fixed timer. Operating logic shall complete this cycle; Input voltage is applied to the timer at all times. Upon closure of a normally open isolated start switch, the load energizes and remains energized as long as the switch is closed. When the start switch opens, the timing cycle starts. At the end of the present time delay, the load de-energizes and the timer is ready for a new timing cycle. Timer shall be UL Recognized component under file number E65038.
- I. Engine Start Switch
 - 1. Start switch shall be engine pressure sensing type capable of recognizing the output pressure of any type of motor vehicle. Electrical contact shall be dry type or not exceed 24V.
- J. Push to Stop Button
 - 1. Shall be Allen Bradley illuminated amber contact push button. This device shall meet UL Type 4X rating. Indicator light/start button shall be mounted on the enclosure cover and be identified by engraved ledger plate.
- K. Wiring
 - 1. Wiring shall be run in wire channel to allow for easier identification of wiring circuit and appearance. All wiring circuitry shall meet UL listed for proper bending radii and terminations.
- L. Terminal Block
 - 1. Shall be 600 V, UL rated, recognized and shall provide individual connection points for remote controls, power and motor connections.
- M. Wiring Identification
 - 1. Shall be computer generated and identify all terminals, fuses, contactors, on both supply and termination points.
- N. Labeling
 - 1. Shall be provided and secured permanently to the exterior of electrical controller, indicating the manufacturer, their address and telephone number. The cover shall have user instructions and any warnings or cautions required by Underwriter Laboratories.
- O. Electrical Wiring Schematic
 - 1. Wiring schematic shall be provided with each electrical control box supplied. Wiring schematic shall show internal circuitry as well as all primary and secondary connections to the controller. This schematic shall be provided as a "D" print drawing to the department.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Do not operate fans for any purpose until ductwork is clean, bearings lubricated, and fan has been test run under observation.
- C. Install fans with resilient mounting and flexible electrical leads. Fan shall be roof mounted and/or hung from structure above as indicated on the drawings. Exhaust shall discharge at a minimum 3'-0" above roof level.
- D. Install flexible connections at fan inlet. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.

- E. Furnish all labor and material necessary to modify the existing tail pipes to meet the manufacturers specifications. All modifications shall be completed using chromed materials.
- F. Provide pitot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Coordinate placement of roof, wall, and/or floor penetrations.
- I. Provide overhead exhaust rails and/or track systems at the locations shown on the contract drawings. Lengths shall be field verified with the owner to adequately meet the vehicle requirements.
- J. All tracks shall terminate within 1 foot of their respective overhead doors.
- K. All roof work shall be performed by a qualified roofing contractor so as not to avoid any warranties that may exist.
- L. A high velocity no loss stack head shall be installed to the output of the blower unit as per the American Conference of Governmental Industrial Hygienists recommended practices.
- M. An Inline silencer shall be installed to the output of the Blower Unit to reduce Noise levels.
- N. A galvanized steel enclosure with sound absorbing insulation shall be mounted around each fan assembly.
- O. All exterior ductwork and enclosure shall be properly prepared and painted to blend into surrounding conditions.
- P. All electrical control work as required for a complete and functional system.
- Q. All district Vehicles shall be modified to accept the exhaust system.
- R. All penetrations through concrete or block walls shall be core drilled.
- S. System shall be tested and balanced in accordance with specification section 230594.
- T. Inspect system for proper operation at completion of construction.

3.02 OPERATOR TRAINING

A. Shall be provided, one (1) training session per location. A minimum of 48 hours notice shall be required prior to the scheduling of this training session.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the outdoor air inlets and outlets, blank offs, louver infill system, 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 / Exhaust Louvers
 - 2. Glazing Panels
 - 3. Louver Infill Framing System

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 REFERENCE CODES AND STANDARDS

- 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. ASTM C1193 Standard Guide for Use of Joint Seals
- I. Mechanical Code of New York State

1.04 SUBMITTALS

- A. General Product Data Submit catalog cuts and installation instructions for all products specified, including standard color samples.
- B. Louvers:
 - 1. Submit published manufacturer's performance data for all of the different types of louvers.
 - 2. Performance Data For each size and type, submit the following:
 - a. Free area
 - b. Maximum airflow in cfm
 - c. AMCA 511 performance data

C. Panels:

- 1. Samples:
 - a. Insulated Infill Panels: 12" x 12" size required. Samples shall have included all proposed coatings and be assembled with appropriate spacers and decorative elements.
 - b. Exterior and Interior Finish samples: 3" x 3" samples of the full manufacturers range of Standard Kynar colors offered
- 2. Submission Drawings: Indicate thickness, dimension and components of parts. Detail methods, framing and tolerances to accommodate thermal movement.

D. Framing:

- 1. Mullion details, including reinforcement and stiffeners.
- 2. Joinery details.
- 3. Weather-stripping details.
- 4. Thermal-break details.
- 5. Submit any other components as required for Architect's approval. No fabrication shall be started until such approval is received. Contractor will verify all opening dimensions in the field and be responsible to provide proper size frame to fit all existing openings and note same on Shop Drawings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect finish and edge in accordance with panel manufacturer's recommendations.
- B. Store materials in accordance with panel manufacturer's recommendations.

1.06 QUALITY ASSURANCE

- A. Field measurements shall be taken prior to completion of manufacturing and cutting.
- B. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" (3mm) in 20' (6m) non-commutative

PART 2 - PRODUCTS

2.01 OUTSIDE AIR INTAKE / EXHAUST LOUVERS

- A. Louvers General:
 - 1. Furnish and install louvers of the sizes and capacities as shown on the Drawings.
 - 2. Coordinate color with Owner & Architectural drawings or specification.
 - 3. Options: Refer to schedules
- B. Designation LV-W:
 - 1. Stationary 6 inch deep with extruded blades on 37½-degree slope, heavy channel frame, with 5/8-inch expanded, flattened aluminum bird screen.
 - 2. Fabricate from 6063T6 extruded aluminum.
 - 3. Construction shall be hurricane rated with a maximum wind load of 148 PSF.
 - 4. Nominal 57% free area.
 - 5. Beginning water penetration of 0.01 oz./sq.ft. at 1023 fpm. Maximum pressure drop at 700 FPM shall be 0.08" exhaust.
 - 6. Finish shall be factory finished 70% PVDF.
 - 7. Ruskin Model ELF6375DXD, or approved equal.
 - 8. Designation LV-2:
- C. Designation LV-X:

- 1. Stationary 4 inch deep louver with drainable style blades.
- 2. Frame: heavy gauge 0.081" nominl wall thickness.
- 3. Blades: drainable design, 0.081" nominal wall thickness, 37¹/₂-degree slope on 3" centers.
- 4. Fabricate from 6063T5 extruded aluminum.
- 5. Wind load rating of 25 PSF at 60"x96" size.
- 6. Nominal 55% free area.
- 7. Beginning water penetration of 0.01 oz./sq.ft. at 989 fpm. Maximum pressure drop at 700 FPM shall be 0.08"
- 8. Finish shall be factory mill finish, 70% PVDF or baked enamel.
- 9. Greenheck ESD-435 or approved equal.
- D. Designation LV-Y:
 - 1. Combination 4 inch deep combination louver-motorized damper with drainable style blades and concealed damper linkage within the louver jambs.
 - 2. Frame: heavy gauge 0.125" nominl wall thickness.
 - 3. Blades: drainable design, 0.081" nominal wall thickness, 45 degree slope on 4" centers.
 - 4. Fabricate from 6063T5 extruded aluminum.
 - 5. Seals: dual-durometer extruded vinyl blade seals, compressible stainless steel jamb seals.
 - 6. Side linkage, outside of airstream, synthetic sleeve bearings, 1/2" zinc plated axles.
 - 7. Wind load rating of 25 PSF at 60"x96" size.
 - 8. Nominal 40% free area.
 - 9. Beginning water penetration of 0.01 oz./sq.ft. at 1023 fpm. Maximum pressure drop at 700 FPM shall be 0.08"
 - 10. Finish shall be factory mill finish, 70% PVDF or baked enamel.
 - 11. Greenheck EAC-401 or approved equal.
- E. Designation LV-Z:
 - 1. Combination 4 inch deep combination exhaust louver-gravity damper with drainable head member, J style stationary louver blades, with pressure/gravity operated damper blades.
 - 2. To be used with ducted exhaust air fans not applicable for general buuilding gravity relief.
 - 3. Frame: heavy gauge 0.081" nominl wall thickness.
 - 4. Blades: J style, 0.081" nominal wall thickness, 45 degree slope on 4" centers.
 - 5. Backdraft damper blade: extruded, 0.062" nominal thickness
 - 6. Fabricate from 6063T5 extruded aluminum
 - 7. Bearings: synthetic sleeve
 - 8. Insect Screen: 3/4" x 0.051" expanded aluminum in removable frame
 - 9. Wind load rating of 25 PSF at 60"x120" size.
 - 10. Static Pressure Drop: 0.10" at 350 FPM
 - 11. Finish shall be factory mill finish, 70% PVDF or baked enamel.
 - 12. Greenheck GCE-402 or approved equal.

2.02 GLAZING PANELS:

- A. Recommended for use as an infill panel component in following window framing systems.
- B. Insulated glazing panel consisting of closed cell foam plastic core bonded on both sides to a thermoplastic stabilizer with a texture/color finished aluminum sheet each face.
 - 1. Assembly thickness: 1" (2.0 PCF EPS core with 0.022" 3003 or 5005 Aluminum skins
 - 2. Finish: Smooth or Stucco Embossed; PVDF, Polyester or Anodized
 - 3. R-Value: 3.3
 - 4. Wind Load at 48" span 50 PSF
 - 5. Laminators Inc. Thermolite or approved equal
- C. Accessories
 - 1. Related material to complete installation as recommended by the manufacturer.

- 2. Neoprene setting blocks and spacer shims as approved by manufacturer
- 3. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20 year life are recommended.
- 4. Tapes shall be Tremco's 440 Tape or Polybutylene 3MN-EC1201.
- 5. Sealants and tapes shall conform to N.A.A.M.M. Specification for classes of work involved.
- 6. Glazing sealant on exterior shall be Tremco "Mono" or GENERAL ELECTRIC "Silicone Construction Sealant", color as selected by the Architect/Engineer.

2.03 WINDOW (X-LOUVER) FRAMING SYSTEMS:

- A. Window framing system for 1" glazing (to be used with glazing panel above) for removed louver opening infill.
 - 1. Frame sections: 2 1/4" H x 4 1/2" D, offset.
 - 2. Provide top, side and bottom frame details appropriate for installation on existing surfaces per manufacturer recommedations. Provide shear block inside set for pitched sills.
 - 3. Extruded alumimum
 - 4. Anodized finish
 - 5. Arcadia TC470 Series or approved equal

PART 3 - EXECUTION

3.01 LOUVER 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 flashing, sheet metal, gaskets, and all other seal materials appropriate for inteded use, and work required to ensure a weather tight building exterior construction and air tight interior seal between sleeve/duct/plenum and building opening as required.
- E. Ensure existing sill is pitched towards exterior a minimum of 1/4" per foot. Provide supplementary wood framing and aluminum flashing or built up concrete sill as required.

3.02 GLAZING PANEL INSTALLATION

- A. Erect panels plumb, level and true in accordance with the manufacturers specifications of the glazing panels and framing system.
- B. Glaze panels securely and in accordance with approved shop drawings and manufacturers instructions to allow for necessary thermal movement and structural support.
- C. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
- D. Center panels in glazing rabbet to maintain recommended clearances at perimeter for expansion and contraction of each face of the panel.
- E. Weatherseal all joints as required using methods and materials as previously specified

3.03 FRAME AND PANEL INSTALLATION

- A. Before starting installation examine work to receive panel frames scrape and clean all surfaces to based materials suitable for attachment, structural integrity, and sealing weather tight.
- B. Build-up surfaces that do not meet manufacturer tolerances for level, plumb, and surface deviation per length with suitable materials.
- C. Ensure existing sill is pitched towards exterior a minimum of 1/4" per foot. Provide supplementary wood framing and aluminum flashing or built up concrete sill as required.
- D. Immediately prior to installing panels, all surfaces shall be wiped clean and free of protective coatings, moisture, and dust.
- E. Install framing system per manufacturer instructions with all appropriate connectors, supports, fasteners and other manufacturer specific components.
- F. Erect panels plumb, level and true in accordance with the manufacturers specifications.
- G. Glaze panels securely and in accordance with approved shop drawings and manufacturers instructions to allow for necessary thermal movement and structural support.
- H. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
- I. Weatherseal all joints as required using methods and materials as previously specified.
- J. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction
- K. Center panels in glazing rabbet to maintain recommended clearances at perimeter for expansion and contraction of each face of the panel.
- L. After installation, protect exposed portions of aluminum surfaces from damage by grinding and polishing compounds, plaster, lime, acid, cement, or other contaminants.
- M. Remove masking film as soon as possible after installation. Masking intentionally left in place after panel installation will be the responsibility of the contractor.
- N. Weep holes and drainage channels must be unobstructed and free from dirt and sealant.
- O. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.
- P. Touch-up, repair or replace damaged products before substantial completion.

END OF SECTION

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.
 - Provide with molded fiberglass insulation blanket with foil back vapor barrier minimum R 4.2
 - 7. Manufacturer: Nailor Industries Inc, Model Series UNI, RNS or approved equal.
 - 8. 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 ¼" 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 ½" 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 ½" 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 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 TRANSFER GRILLES

- A. Furnish and install supply grilles of the type and size as shown on the Drawings. Grilles shall be sight proof.
- B. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.

- C. The grille shall have inverted "V" shaped blades and frames. The grille shall be sight-proof.
- D. Manufacturer: Nailor Industries Inc., Model Series 61DGS or approved equal.
- E. Coordinate color with Owner.

2.07 LINEAR DIFFUSERS

- A. Furnish and install linear slot diffusers and accessories of the size and type shown on the drawings. Mechanical contractor shall coordinate installation with General Contractor and other subcontractors as required.
- B. The linear slot diffuser shall utilize heavy wall extruded aluminum frames and be capable of supporting the ceiling system. Material shall be minimum wall thickness 0.06" (1.52). Diffuser frames shall be supplied with integral spacer bars and hanger brackets, spaced approximately on 24" (610) centers. In hard ceiling installations, provide support clips by the manufacturer that allow the diffusers to be secured to the ceiling diffuser opening framing channels.
- C. The linear slot diffuser shall be complete with factory end border configurations as shown or indicated. Where exposed end caps are required, they shall be factory installed architectural mitered picture frame type. Flanges/butt type end caps are not acceptable.
- D. Provide alignment strips and spline clips by the manufacturer to secure joints and ceiling tees to the linear diffuser as required. Mitered corner sections shall be supplied by the manufacturer in one-piece construction.
- E. The air pattern controller shall be dual type on 24" (610) centers and fully adjustable to permit various air pattern configurations, as well as allow throttling, as required for air volume reduction or complete shut-off without adding any blank-off devices. Pattern controllers shall be minimum 20 ga. (1.01) corrosion-resistant steel. One-piece pattern controllers are not acceptable.
- F. Linear slot diffusers shall incorporate vertical jet throw pattern controllers.
- G. All diffusers shall have a single slot, unless shown otherwise, and shall be capable of being used for supply, return or exhaust air.
- H. Supply air engineered plenum boots shall be minimum 22 ga. (0.85) coated steel and of the same manufacturer as the linear slot diffuser. Lengths and inlet sizes shall be as indicated on the plans and schedules. Where required, plenums shall be insulated with either internal matt faced fiberglass insulation or external foil back insulation, as specified on drawings or schedules. Return hood/sight baffles shall be provided as shown.
- I. Pattern controllers and integral spacers shall be painted flat black.
- J. Performance of the linear slot diffuser shall be based upon cataloged data obtained from tests conducted in accordance with ASHRAE Standard 70, latest edition. Pattern controllers shall be field adjusted after diffuser installation and set in their normal operating condition. Air test and balancing of linear slot diffusers shall be in accordance with the testing and balancing portion section of the specifications.
- K. Provide manufacturers submittal drawings and published performance data.
- L. Manufacturer: Nailor Industries Inc., Continuous Flowline Series Model FLV15 or approved equal.

2.08 LINEAR SLOT SUPPLY AND RETURN DIFFUSERS

- A. Furnish and install linear slot diffusers of the type and size as shown on the plans and air distribution schedules.
- B. The maximum length of a single section shall be 72" long. All sizes larger than 72" shall be provided in continuous multiple sections. Alignment strips shall be provided for joining continuous diffuser sections together.
- C. The frame borders and end caps shall be extruded aluminum with extruded aluminum spacers.
- D. The linear slot shall be supplied in 1 to 10 slots wide as specified.
- E. Pattern deflectors shall have an aerodynamic 'ice tong' shape that can be adjusted to regulate the volume and direction of the airflow. The maximum length of the deflectors shall be 36", longer sizes shall be provided in multiple sections. The pattern deflector finish shall be black.
- F. Provide inactive sections with blank-offs, end caps, 90 degree mitered corners, etc. as necessary to provide a continuous appearance in areas with multiple section assemblies.
- G. Manufacturer of Linear Slot Diffusers shall be Nailor Industries Inc., Model Series 5000 or approved equal.
- H. Coordinate color with owner.

2.09 LINEAR SLOT DIFFUSER PLENUMS

- A. Furnish and install plenums for linear slot diffusers of the sizes and capacities as shown on the plans and air distribution schedule.
- B. The plenums shall be manufactured from corrosion-resistant steel and shall include a side inlet for connection to the duct.
- C. The width shall fit a 1, 2, 3, or 4 slot linear diffuser as specified and the length shall be in standard nominal lengths of 20", 24", 30", 36", 48", and 60".
- D. When continuous sections are required, the end caps shall be folded up for uninterrupted airflow.
- E. Models 5310I, 5375I, and 5350I shall have internal insulation.
- F. Manufacturer of Linear Slot Diffuser Plenums shall be Nailor Industries Inc., Model Series 5300 or approved equal.

2.10 LINEAR FLOOR DIFFUSERS

- A. Furnish and install linear floor diffusers of the type and size as shown on the plans and air distribution schedules.
- B. Linear floor diffusers shall be designed for installation in the floor.
- C. The diffuser shall have 15 degree deflection bars set on $\frac{1}{2}$ " centers.
- D. The entire assembly shall be constructed of etched and anodized extruded aluminum.

- E. Manufacturer of Linear Floor Diffusers shall be Reliable Products Model LFD15 or approved equal.
- F. Coordinate color with owner.

2.11 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 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. Ductwork insulation, as required per insulation schedule, shall be continuous from supply duct mains, flex ducts (if applicable), up to, and sealed with supply diffuser molded insulation blanket with continuous vapor barrier, regardless of ceiling plenum condition.
- G. 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

PART 1 - GENERAL

1.01 PROVISIONS

- A. Requirements of the General Mechanical Requirements of Division 23 and General Requirements of Division 01 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

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.

1.06 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.

PART 2 - PRODUCTS

2.01 COOKING EQUIPMENT KITCHEN HOOD

- A. Acceptable manufacturers:1. Captive Aire ND-2 Series with PSP Accessory or approved equal.
- 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. 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. 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.
- E. 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.
- F. 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.
- G. U.L. incandescent light fixtures and globes shall be installed and pre-wired to a junction box. The light fixtures shall be installed with a maximum of 4'0" spacing on center and allow up to a 100 watt standard light bulb.
- H. 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. Removable grease cup for easy cleaning.
- I. 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".
- J. Refer to drawings for additional accessories.

2.02 DISHWASHER HOOD

- A. Acceptable manufacturers:1. Captive Aire VHB Series or approved equal.
- B. The dishwasher hood shall be a single vent hood used for non-grease applications for the removal of heat, vapor, etc. The hood shall have size, shape, and performance as specified on the drawings.
- C. The hood shall be constructed of type 304 stainless steel. Finish shall be #3 or #4 polish where exposed. The hood shall be wall type with fully welded 10-gauge corner hanging angles. Corner hanging angles shall have a slot pre-punched at the factory for use with hanging rods.

- D. The hood manufacturer shall supply complete submittal drawings including hood section views and hood plan views. These drawings must be available to the engineer, architect, and owner for their use in construction, operation, and maintenance.
- E. Exhaust duct collar to be 4" high with 1" flange. Duct sizes, CFM, and static pressure requirements shall be as shown on drawings. The hood shall be recognized by NSF.
- F. Refer to drawings for additional accessories.

2.03 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, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off.
- 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.

2.04 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.

2.05 DISHWASHER HOOD CENTRIFUGAL UTILITY SET EXHAUST FANS

A. Utility set exhaust fan shall be suitable for use with a Type II dishwasher hood serving a commercial type dishwasher.

- B. Fan shall have a vented motor cover.
- C. Fan shall be constructed with a corrosion resistant enamel finish.
- D. Provide exhaust fan model BI-CA by CaptiveAire or approved equal.

2.06 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.

2.07 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.

2.08 INLINE DIRECT GAS FIRED HEATED MAKE UP AIR UNIT

- A. A Modular Packaged Heating, Cooling and ventilating unit(s), as indicated on the drawings shall be furnished. Direct Fired Gas Unit(s) shall be tested in accordance with ANSI Standard Z83.4a-2001/CSA 3.7a-2001, and 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. Gas burner
 - 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. Gas piping
 - 8. 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. An observation port shall be located on the exterior of the unit for observation of the main flame and pilot flame. All controls, gas valves, modulating controls and electrical components shall be mounted within the burner vestibule. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream. The vestibule full-size door shall provide easy access to controls and gas-train components. Blower door shall provide easy access to blower, motor and drives. Access doors shall be provided on both front and backside of unit providing full access to every part of the unit.
 - 3. 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. Burner:
 - 1. The gas burner shall be direct-fired, draw-through type, sized to provide the output capacity noted on the drawings using natural gas.
 - 2. The burner shall burn over its entire length at all times when the system is in operation.
 - 3. The burner shall have non-clogging, 4302B stainless-steel combustion baffles attached to a ductile aluminum gas-supply section with no moving parts to wear out or fail. The burner shall be capable of 92% combustion efficiency with a maximum turndown ratio of up to 30 to 1.
 - 4. The gas burner shall be furnished with a pilot package arranged so that the pilot flame lights the burner with instantaneous ignition. Pilot assembly includes a flame rod, spark rod and pilot, which is automatically ignited by ignition transformer. A flame-rod rectification system shall be used to prove pilot and main flame.
 - 5. Rear access doors will provide complete access to burner and pilot assembly.
 - 6. Burner profile plates shall be self-adjusting to operate across the complete CFM range of each model heater. Every unit shall be designed for Variable Air Volume capabilities.
- I. 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
- J. Gas Equipment:
 - 1. All gas equipment should conform to local code requirements. All gas manifold components shall be piped and wired at the factory.
 - 2. Components shall include:
 - a. Pilot-gas shut-off valve
 - b. Pilot-gas regulator
 - c. Pilot-gas valve
 - d. Main-gas shut-off valve
 - e. Main-gas regulator
 - f. Two solenoid valves
 - g. Modulating-gas valve

- h. Burner on gas equipment
- K. 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. Main-gas regulator
 - f. Two safety shutoff valves
 - g. Modulating-gas valve
 - h. Stainless Steel Burner
 - i. Adjustable burner ON/OFF inlet air duct-stat to shut off heat when inlet air is sufficiently warm to maintain space temperature
 - j. Non-Fused Disconnect
 - k. Casing insulation shall be 1" x 1.5" density with a foil face
 - I. Low gas-pressure switch
- L. Accessories shall include, but not be limited to, the following:
 - 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.
- M. 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.
- N. 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.
- O. Unit(s) shall be operated, tested and set at the factory using job-site conditions for electrical and gas 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.

- P. 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.
- Q. Modular Packaged Cooling Unit with Direct-Fired Heated for 100% Outdoor Air applications shall be model A3-D.500-G18 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.

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.
 - H. Provide Model SCC-E-TCO-NO2B-S series by Critical Environment Technologies or approved equal.

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.

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.

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. Shop Drawings: Submit drawings for each size of factory fabricated roof curb.
- B. Product Data: Manufacturer's catalog sheets, brochures, performance charts, standard schematic drawings, specifications and installation instructions for each size unit.
- C. Contract Closeout Submittals Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner'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. Unit shall be stored and handled as per manufacturer's recommendations.
- B. 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, one spare set of air filters. Suitable box and label spare filters as to their usage.

2.01 EQUIPMENT

- A. A. General Specification
 - 1. Furnish and install package DX system for the treatment of up to 100% constant outside air per plans and specifications. Unit(s) shall be completely factory assembled, tested, internally wired, fully charged with Refrigerant R410A, and shipped in one piece.
 - 2. Unit(s) shall consist of insulated weather-tight casing with optional field installed outdoor intake hood, modulated capacity scroll compressors, air-cooled condenser coils, condenser fans, evaporator coils, direct drive supply fan, factory installed VFD, and unit controls.
 - 3. Packaged Cooling and Heating Units shall carry an ETL listing. Manufacturer must have at least 20 years experience in manufacturing makeup air equipment.
- B. Refrigerant System
 - 1. Compressor systems shall be designed to provide 10 100% capacity control for treatment of up to 100% outside air with up to 80 degree dewpoint entering the unit. Hermetic compressors shall include a scroll design with internal pressure relief and motor temperature winding protection.
 - 2. Units shall be equipped with reversal rotation protection. Refrigeration protection shall include low and high pressure switches, refrigerant circuit frost protection, liquid line filters/dryers and service gage ports. Refrigeration control shall include thermal expansion valves, external equalizers and distributors for each compressor.
 - 3. Hot gas bypass options shall be available on all refrigerant stages in addition to multiple steps of capacity modulation to supplement discharge air control.
 - 4. The refrigerant system shall have an adjustable 5 minute minimum ON and minimum OFF timer circuit protection. The refrigerant circuit shall have an anti-cycle time in addition to the minimum ON/OFF timer that prevents the compressors from cycle on the minimum timer circuit. The unit shall have optional low ambient kit.
 - 5. The condensate drain pan shall be corrosion proof material. The drain outlet shall be double sloped drain pan with a minimum 1/8" per foot slope. The sloped drain pan shall be of a removable design. The drain pain shall collect potential condensate from all evaporator/condenser coils and distributor area in the air stream to prevent blow-off condensate reaching unprotected bottom unit surfaces.
- C. Reheat Systems
 - Model shall include a dedicated modulating compressor and refrigeration circuit using full condenser reheat or total heat of rejection in the supply airstream. The circuit shall be capable of delivering a nominal 13°F- 17°F temperature rise from the main evaporator temperature without the need for modulating the capacity for all entering outside air conditions. The compressor shall modulate to maintain other than neutral air conditions per customer adjusted setpoint.
 - 2. All methods of reheat shall comply with ASHRAE 90.1 requirements. Dual compressor systems shall be designed to provide 4-8 stage capacity increment using integrated DDC control. The refrigerant circuits shall include thermal expansion valves with external equalizers. Service gage ports and refrigerant line filter dryers are factory installed as standard. Pre-cooling coils shall be two row depth with 6 fin per inch to minimize air pressure drop. The reheat coil position shall include a minimum separation of 6" from the cooling coil to eliminate re-evaporation of cooling coil condensate.
- D. Evaporator and Condenser Coils
 - 1. The refrigerant system shall include a horizontal discharge air cooled condenser. The copper tube-aluminum plate fin evaporator coil to be 4 rows with 15 fins per inch to meet SHR values of 0.60. All multi-circuit evaporator coils are of the interlaced and split face

configuration to reduce the risk of coil freezing at part load. All evaporator coils shall be protected from frosting by a low temperature cutout. All Coils shall be leak tested at the factory to ensure pressure integrity. [Coils shall have ElectroFin[™] coating for protection from corrosion].

- 2. The condenser coils shall be aluminum micro-channel type condensing coil [A coil guard will be included for protecting the condensing section.] Units will ship completely charged for immediate operation upon installation and check-out of the unit.
- E. Gas Heat (Natural)
 - 1. Heating shall be provided by a gas-fired heating section designed to provide a 5:1 power vented modulation with a minimum 80% thermal efficiency throughout the modulated range. The system shall modulate the gas and combustion air to maintain temperature setpoint and thermal efficiency.
 - The heat exchanger shall be capable of 100 degree temperature rise for 100% outside air treatment. The heating system shall be factory installed and design certified to ANSI Standard Z83.8/CSA 2.6. The heat exchanger shall be tubular design constructed of 409 stainless steel.
 - 3. The gas burner shall be direct spark, multi-try, with a flame sensing circuit monitored by an electronic flame supervision system with 100% lockout via an integrated circuit board that incorporates LED diagnostics. Diagnostic codes shall include failed ignition.
 - 4. Certifications: The gas heat sections shall be approved to ANSI Z83.8/CSA 2.6. The packaged unit shall be certified to UL-1995 UL Standards for Safety Heating & Cooling Equipment Second Edition: CAN/CSA C22.2 NO. 236-95. Safety Features: All heat sections for said unit shall feature factory installed:
 - a. Automatic discharge air limit control
 - b. Air proving pressure switch
 - c. Color coded wiring and matching terminal blocks
 - d. Circuit breaker protected transformers
- F. Cabinet
 - 1. Outer casing is fabricated from G90 galvanized steel substrate with 60 gloss painted finish coat. Structural members shall be 18 gauge with double-wall foamed construction panel for all exterior surfaces.
 - 2. The unit shall have an overall R13 insulation value.
 - 3. The cabinet design shall prevent condensation forming on the outside of the unit casing in operation. Fully gasketed, hinged doors of double-wall foam construction shall provide access to filters, dampers, evaporator coils section, supply fan section, energy recovery wheel and exhaust fan. Provide hinged single wall construction doors for the heater section and control section. The unit shall have lockable door access.
 - 4. The unit control panel section shall be laid out to provide separation of high and low voltage components per UL standards. High voltage wiring shall be touch safe utilizing power distribution rails, race ways and wiring harnesses. The control panels shall be hinged for easy access to the unit controls. For ease of service, all electrical components will be clearly identified with 1/2" diameter self adhesive labels to match the unit specific wiring diagram. The low voltage and unit controller access electrical panel shall be physically isolated from the high voltage section. The open door to the control section will reveal the wiring diagrams, DDC programming instructions and all manuals and literature protected and permanently attached to the cover. All control transformers will incorporate integral, resettable circuit breaker protection.
 - 5. An optional weatherproof convenience outlet will be accessible from the outside of the unit without the removal of any doors or access panels.

G. Air Side

1. The outdoor condenser fan shall be direct drive, statically and dynamically balanced, draw through in the vertical position. The condenser fan motor(s) shall be permanently lubricated and have built-in thermal overload protection. [Optional high efficiency ECM

motors shall be provided with speed control directly connected to the unit control system.] The fan sled shall be direct drive with an ABB variable frequency drive allowing peak fan efficiency and system RPM.

- 2. The fan system shall utilize Ziehl-Abegg patented rotating diffuser which reduces noise and helps increase overall system efficiency. The fan sled shall have slide out design for easy inspection and replacement. The fan sled shall also allow inspection of the gas or electric heat exchangers. The fan sled shall have rubber dampers to isolate and minimize vibration. The 7 blade, welded construction impeller shall be dynamically balanced at the factory with hub; admissible vibration level less than 2,8 mm/s (0.11 in/s) in conformity with ANSI/AMCA 204. The fan sled shall include Inlet cone with measuring device for airflow measurement.
- 3. The packaged unit shall allow fan inlet differential pressure readings inside the control panel to measure supply fan CFM with an accuracy of +/-5%.
- 4. The unit controller shall allow fan speed settings for occupied and unoccupied modes. The unit controller shall allow fan speed settings for heating and cooling modes.
- 5. The fan system shall be made of galvanized steel. The impeller shall have RAL 5002 coating, directional arrows marketing. The fan sled shall allow up to 176°F (80°C) for the impeller and the motor shall allow ambient temperatures -4°F to 104°F (-20°C to 40°C). The impeller and motor shall be designed for continuous operation.
- 6. The ABB frequency drive shall be factory installed with line reactor, ECM Filter and all necessary wiring per UL standard. The drive shall have built in menu drive display with test, start-up, maintenance and diagnostic assistant. The drive shall be factory programmed for 30 second soft start. The drive shall have the following protection and alarms: single phase, over-voltage trip limit, under voltage trip limit, over temperature, microprocessor fault, motor stall protection, motor over temperature.
- 7. The unit shall meet the schedule performance. The unit control system shall have test and balance function to allow permanent setting of the airflow(s) as shown in the mechanical schedule.
- H. Controls
 - 1. The unit control panel section shall be laid out to provide separation of high and low voltage components per UL Standards. The primary control panel shall be hinged for easy access. Controls shall be factory configured for the design application with both the required hardware, operating parameters, and typical default control setpoints.
 - 2. The controller is factory mounted on the unit and is pre-wired to the unit controls. The controller shall have visual (LED) status of power, running, and errors. LED indicators for transmit/receive for networks and for each of the 12 outputs. The controller shall have unit mounted display with two line 40 alpha/numeric character per line display providing full access to all commission variables, setpoints, alarms and diagnostic functions. The controller shall have BACnet (ARC156, MS/TP, and PTP) network communication available without the need for further programming or external devices.
 - 3. The control system shall have the capability to communicate using LonWorks protocol. [Customer wall-mounted controls shall be available for providing [remote temperature adjustment] [on/off -auto control].
 - 4. Each unit shall be equipped with an air-proving switch to ensure proper blower operation prior to enabling cooling and heating functions. Cooling controls shall include minimum "on/off" compressor time delays and anti-cycling program to prevent unnecessary wear of compressor.
 - 5. Commissioning control variables shall include outdoor setpoints for heating and cooling sequencing based on outdoor drybulb, discharge or space temperature setpoints and low limit discharge air settings for freeze protection.
 - 6. The alarm functionality shall include low temperature, compressor failure, sensor failure, smoke alarm, power failure, heating failure and supply fan failure. The failures shall protect the unit and displays a code at the unit's display and the optional wall mounted display.

- 7. The unit will have test and diagnostics routines for services and start-up. The control system shall be able to provide D21 neutral air and space temperature control per the sequence of operation shown.
- I. Outdoor Air Section
 - Units shall be available with fully integrated factory installed 100% motorized outdoor air damper. The motorized damper shall be spring return for closure during unit shutdown or power interruption. The outsider air dampers shall be controlled occupied and unoccupied positions. Outdoor air inlet hood shall include 1" permanent filters. Units designed for 100% outside air intake only shall include an integrated transition section (without return air opening) designed specifically for 100% outside air introduction to allow uniform coil velocity and filter loading.
- J. Filters
 - 1. Filters shall mount integral within unit casing and be accessible through hinged access panel. Filters shall be 4" disposable pleated MERV13.
- K. Full Perimeter Curbs
 - 1. The curbs available from the manufacturer shall be designed to meet the National Roofing Contractors Association August 1985 guidelines for roof mounted installations. The roof curbs shall be 12 gauge zinc coated steel with a 2" x 6" nailer. Factory curb shall be required for systems requiring horizontal discharge or return air connection. The curb is to be shipped knocked down with assembly instructions. The curb shall incorporated energy recovery options.
- L. Options and Accessories
 - 1. Refer to equipment schedules on drawings.

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 Owner's 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 Owner's Personnel in the operation and maintenance of the air conditioner and accessories.

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Outdoor, roof curb mounted, electronically controlled, heating and cooling unit utilizing hermetic scroll compressor(s) 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.
- B. Outdoor, roof curb mounted, air-to-air heat pump unit utilizing a hermetic scroll compressor 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. Section 233113 Sheet Metal Work.
- B. Division 26.

1.03 SUBMITTALS

- A. Shop Drawings: Submit drawings for each size of factory fabricated roof curb.
- B. Product Data: Manufacturer's catalog sheets, brochures, performance charts, standard schematic drawings, specifications and installation instructions for each size unit.
- C. Contract Closeout Submittals Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Owner'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. 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.
 - 8. Unit shall meet ASHRAE 90.1 minimum efficiency requirements.
 - 9. 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 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, one spare set of air filters. Suitable box and label spare filters as to their usage.

PART 2 - PRODUCTS

2.01 GAS HEAT/ELECTRIC COOLING PACKAGED ROOFTOP UNITS

- A. General
 - 1. Units shall be manufactured by Carrier in an ISO 9001 certified facility. The units were designed for light commercial applications and can be easily installed on a roof curb, slab, or frame. All units are self-contained and assembled on rigid full perimeter base rails allowing for 3-way forklift access and overhead rigging. Every unit is completely charged with R-454B, wired, piped, and tested at the factory to provide a quick and easy field installation. All units are convertible between side and down airflow. Independent economizer designs are used on side and down discharge applications, as well as all tonnage sizes.
- B. Description
 - Units shall be factory assembled, single package, (Gas/ Elect), designed for outdoor installation. They shall have built in field convertible duct connections for down discharge supply/return or horizontal discharge supply/return and be available with factory installed options or field installed accessories. The units shall be factory wired, piped and charged with R-454B refrigerant and factory tested prior to shipment. All unit wiring shall be both numbered and color coded. The cooling performance shall be rated in accordance with DOE and AHRI test procedures. Units shall be CSA certified to ANSI Z21.47 and UL 1995/CAN/CSA No. 236-M90 standards.
- C. Unit Cabinet
 - Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a 1 non-chalking, powder paint finish, certified at 1000 hour salt spray test per ASTM-B117 standards. Indoor blower sections shall be insulated with up to 1" thick insulation coated on the airside. Either aluminum foil faced or elastomeric rubber insulation shall be used in the unit's compartments and be fastened to prevent insulation from entering the air stream. Cabinet doors shall be hinged with toolless access for easy servicing and maintenance. Full perimeter base rails shall be provided to assure reliable transit of equipment. overhead rigging, fork truck access and proper sealing on roof curb applications. Disposable 2" filters shall be furnished as standard and be accessible through hinged access door. 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 bypass of the coils. Condensate pan shall be slide out design, constructed of a non corrosive material, internally sloped and conforming to ASHRAE 62-B9 standards. Condensate connection shall be a minimum of ¾" I.D. female and be rigid mount connection.
- D. Outdoor (Condenser) Fan Assembly
 - 1. The outdoor fans shall be of the direct drive type, discharge air vertically, have aluminum blades riveted to corrosion resistant steel spider brackets and shall be dynamically balanced for smooth operation. The outdoor fan motors shall have permanently lubricated

bearings internally protected against overload conditions and staged independently. A cleaning window shall be provided on two sides of the units for coil cleaning.

- E. Refrigerant Components
 - 1. Compressors:
 - a. Shall be fully hermetic type, direct drive, internally protected with internal high-pressure relief and over temperature protection. The hermetic motor shall be suction gas cooled and have a voltage range of + or 10% of the unit nameplate voltage.
 - b. Shall have internal spring isolation and sound muffling to minimize vibration and noise, and be externally isolated on a dedicated, independent mounting.
 - 2. Coils:
 - a. Evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally enhanced copper tubes with all joints brazed. Special Phenolic coating shall be available as a factory option.
 - b. Evaporator coils shall be of the direct expansion, draw-thru design.
 - c. Condenser coils shall have aluminum plate fins mechanically bonded to seamless internally enhanced copper tubes with all joints brazed or Micro-Channel aluminum tube, aluminum fins. Special Phenolic coating shall be available as a factory option.
 d. Condenser coils shall be of the draw-thru design.
 - 3. Refrigerant Circuit and Refrigerant Safety Components shall include:
 - a. Independent fixed-orifice or thermally operated expansion devices.
 - b. Solid core filter drier/strainer to eliminate any moisture or foreign matter.
 - c. Accessible service gage connections on both suction and discharge lines to charge, evacuate, and measure refrigerant pressure during any necessary servicing or troubleshooting, without losing charge.
 - d. The 6-1/2 through 12-1/2 ton unit shall have two independent refrigerant circuits, equally split in 50% capacity increments.
 - 4. Unit Controls:
 - a. Unit shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-volt transformer side.
 - b. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit should any of the following standard safety devices trip and shut off compressor:
 - 1) Loss-of-charge/Low-pressure switch.
 - 2) High-pressure switch.
 - 3) Freeze-protection thermostat, evaporator coil. If any of the above safety devices trip, an LED (light-emitting diode) indicator shall flash a diagnostic code that indicates which safety switch has tripped.
 - c. Unit shall incorporate "AUTO RESET" compressor over temperature, over current protection.
 - d. Unit shall operate with conventional thermostat designs and have a low voltage terminal strip for easy hook-up.
 - e. Unit control board shall have on-board diagnostics and fault code display.
 - f. Standard controls shall include anti-short cycle and low voltage protection, and permit cooling operation down to 0 °F.
 - g. Control board shall monitor each refrigerant safety switch independently.
 - h. Control board shall retain last 5 fault codes in non-volatile memory, which will not be lost in the event of a power loss.
- F. Gas Heating Section
 - 1. Heat exchanger and exhaust system shall be constructed of aluminized steel and shall be designed with induced draft combustion with post purge logic, energy saving direct spark ignition, and redundant main gas valve. The heat exchanger shall be of the tubular type, constructed of T1-40 aluminized steel for corrosion resistance and allowing minimum

mixed air entering temperature of 40 °F. Burners shall be of the in-shot type, constructed of aluminum-coated steel. All gas piping shall enter the unit cabinet at a single location, through either the side or bottom, without any field modifications. An integrated control board shall provide timed control of evaporator fan functioning and burner ignition. Heating section shall be provided with the following minimum protection:

- a. Primary and auxiliary high-temperature limit switches.
- b. Induced draft pressure sensor.
- c. Flame proving controls.
- All two stage gas units shall have two independent stages of capacity (70% or 75% 1st stage, 100% 2nd stage) 3 through 5 ton and (60% 1st stage, 100% 2nd stage) 6-1/2 through 12-1/2 ton.
- G. Unit Operating Characteristics
 - Unit shall be capable of starting and running at 125 °F outdoor temperature, exceeding maximum load criteria of AHRI Standard 340/360. The compressor, with standard controls, shall be capable of operation down to 0 °F outdoor temperature. Unit shall be provided with fan time delay to prevent cold air delivery before heat exchanger warms up. (Gas heat only)
- H. Electrical Requirements
 - 1. All unit power wiring shall enter unit cabinet at a single factory provided location and be capable of side or bottom entry to minimize roof penetrations and avoid unit field modifications. Separate side and bottom openings shall be provided for the control wiring.
- I. Standard Limited Warranties
 - 1. Compressor 5 Years, Heat Exchanger 10 Years, Stainless Steel Heat Exchanger 15 Years, Electrical Heat Elements. 5 Years, Parts 1 Year.
- J. Factory Installed Options:
 - 1. Hot Gas Reheat When the RCB detects a need for dehumidification (24VAC) at "HUM" via the field supplied dehumidistat connected to RHTB-1 and RHTB-2, and there is not a call for cooling, it energizes the HGR, which energizes the SOL 3, SOL 2, and de-energizes SOL 1. The unit then operates with circuit #1 in reheat mode and circuit #2 in cooling mode. When the room thermostat calls for first stage cooling while there is still a call for dehumidification, no operational change is made. The call for cooling is ignored and the unit continues to operate with circuit #1 in reheat mode and circuit #2 in cooling mode. When the room thermostat calls for second stage cooling, the RCB senses a signal through "Y1" & "Y2" and de-energizes the HGR, which de-energizes SOL 3 and SOL 2, and energizes SOL 1. Both circuits operate in the cooling mode. Indoor blower operation is initiated upon a call for first stage cooling, second stage cooling or dehumidification.
 - 2. Powered Convenience Outlet Unit is provided with an internally powered 120VAC GFCI outlet with cover on the corner of the unit housing the compressors.
 - 3. Coil Guard Designed to prevent condenser coil damage
 - 4. BAS Controls Include supply air sensor, return air sensor, dirty filter indicator and air proving switch
 - 5. Breaker An HACR breaker can be factory installed on gas heat units or cooling units with electric heat
 - 6. Stainless Steel Heat Exchanger For applications in a corrosive environment, this option provides a full stainless steel heat exchanger assembly.

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 Fire District 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 Fire District Personnel in the operation and maintenance of the air conditioner and accessories.

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. The Air Conditioner or heat pump system shall be a Mitsubishi Electric 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 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.

2.02 RECESSED CEILING CASSETTE

- A. General
 - 1. The indoor unit shall be a space-saving ceiling-recessed cassette type, factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, drain left mechanism, control circuit board, fan, and fan motor. The unit, in conjunction with the remote controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch.
- B. Unit Cabinet
 - 1. The cabinet shall be formed from galvanized sheet metal coated with high-density foam insulation. Cabinet shall be for recessed mounting and provided with four (4) corner mounting supports behind removable corner pockets in Grille assembly allowing adjustment of mounting height from front of unit.
 - 2. A separate grill assembly shall be attached to the front of the cabinet to provide supply air vanes in four directions and a center mounted return air section. The four-way grill shall be fixed to bottom of cabinet allowing two, three or four-way blow. The grill vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space. Grill assembly color shall be white.
- C. Fan

- 1. The indoor fan shall be an assembly with a turbo fan propeller, direct driven by a single motor and shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings. The indoor fan shall consist of four (4) speed settings. 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. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow with switches that can be set to provide optimum airflow based on ceiling height and number of outlets used. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
- E. Filter
 - 1. Return air shall be filtered by means of a removable washable filter.
- F. Coil
 - 1. The indoor unit coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing.
 - 2. The coils shall be pressure tested at the factory.
 - 3. A condensate pan with drain connections shall be provided under the coil. The unit shall also include a built-in, automatic condensate lift mechanism that will be able to raise drain water above the condensate pan. The lift mechanism shall be equipped with a positive acting liquid level sensor to shut down the indoor unit if liquid level in the drain pan reached maximum level.
 - 4. Both refrigerant lines between the indoor unit and outdoor unit shall be fully insulated.

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.

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.

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. 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. The basis of design is Toshiba/Carrier. 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.

SECTION 238126.12 - MULTIPLE EVAPORATOR, DIRECT EXPANSION, AIR-COOLED, VARIABLE CAPACITY, SPLIT SYSTEMS H2M

- 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 FOOT X 2 FOOT)

- 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:

SECTION 238126.12 - MULTIPLE EVAPORATOR, DIRECT EXPANSION, AIR-COOLED, VARIABLE CAPACITY, SPLIT SYSTEMS H2M

- 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 inches 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, 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 when.
- 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 adjustable external static pressure 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 return air thermistor.
 - 5. The indoor unit shall be separately powered. Refer to equipment schedule 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 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.
- 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.

2.05 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:

SECTION 238126.12 - MULTIPLE EVAPORATOR, DIRECT EXPANSION, AIR-COOLED, VARIABLE CAPACITY, SPLIT SYSTEMS H2M

- 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.

2.06 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.

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.

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Electric Unit Heaters.
- B. Electric Cabinet Unit Heaters.
- C. Electric Ceiling Heaters.
- D. Electric Wall Heaters.
- E. Electric Baseboard.
- F. Electric Duct 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 UNIT HEATERS

- A. Electric unit heater shall be Model ASHU as manufactured by Stelpro or approved equal. Refer to equipment schedule for mounting type.
- B. Heater to be of the KW rating, voltage and phase specified in the schedule.
- C. Unit Casing: Unit shall have heavy gauge die-formed steel casing with a corrosion resistant finish. Top of casing shall have two threaded holes for threaded rod suspension. Bottom of casing shall have a hinged panel for service access to wiring and controls.
- D. Heating Elements: Aluminum-finned, copper clad steel sheath heating element. Elements shall have kilowatt rating as specified. Provide automatic reset linear thermal cut-out, capillary type, to provide protection over entire length of element areas.
- E. Fan Delay Control: Fan control shall delay fan start up of the fan motor until the heating elements have warmed up. It shall maintain motor operation air heating elements have been de-energized to dissipate residual heat.
- F. Motor and Fan: The motor shall be totally enclosed, continuous duty, with automatic resetting, thermal-overload protection. Propeller fan shall be directly connected to the motor shaft and be statically balanced. Motor mounted with rubber vibration absorbing material.
- G. Electrical: All units shall have built-in contactors and low voltage control circuit transformers to provide single-source power connection. Built-in fuse blocks and factory supplied fuses shall be installed on all models with a 208-volt single-phase power supply. Factory mounted disconnect

switches shall be provided. A wiring diagram and grounding lug shall be included in each control compartment.

- H. Air Deflectors: Removable and adjustable horizontal air deflectors shall be furnished on all models.
- I. Thermostat: Each unit shall be furnished with a remote wall mounted, low voltage thermostat, range 40°F to 80°F. Thermostat shall be UL listed.
- J. Supports: Stainless steel hanger rods, double nuts, and ceiling/wall bracket.
- K. Provide other accessories as described on the contract drawings.

2.02 ELECTRIC CEILING HEATERS

- A. Ceiling mounted electric automatic fan forced heaters shall be Model ADRR as manufactured by Stelpro or approved equal. The heaters shall be UL listed and be designed for ceiling surface, recess, or T-bar mounting. Refer to equipment schedule for mounting type.
- B. Heating Assembly: The heating 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 the non-glowing design consisting of 80/20 NiCh resistance wire and closed 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 controls hall be of bi-metallic, snap action type and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after thermostat is satisfied and until the heating element is cool.
- F. Thermal Cutout: A thermal cutout shall be built into the system to shut off the heater in the event of overheating.
- G. Disconnect Switch: A double-pole single throw disconnect switch shall be mounted on the back box for positive disconnect or power supply. It will be completely concealed behind the faceplate.
- H. Back Box: The back box shall be designed for duty as a recessed rough-in box. The back box shall be 20-gauge galvanized steel and shall contain knockouts through which power leads are brought.
- I. Faceplate: The louvered faceplate shall be of 14-gauge cold-rolled steel, phosphatized, then electrostatically painted by a baked enamel process. A 1/4 inch mesh screen shall be installed beneath the faceplate to deter the insertion of foreign objects. The faceplate shall be secured to the heating unit with tamper-resistant screws.
- J. Provide other accessories as described on the contract drawings.

2.03 ELECTRIC WALL HEATERS

A. Wall mounted electric automatic fan forced heaters shall be Model AWFA or ASSO 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 contracts. 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.

2.04 ELECTRIC BASEBOARD

- A. Electric Baseboard heater to be model AALUX, manufactured by Stelpro, or approved equal. Heaters shall be UL listed.
- B. Enclosure: The heaters shall be fabricated of minimum .024 inch steel with minimum .035 inch steel control boxes. Junction box enclosure to have provisions for incoming and outgoing cable with cable clamp for restraining without additional hardware. Ground wire pigtail provided in each junction box for grounding.
- C. Front Cover: The front cover shall be fabricated of minimum 0.26 inch pre-painted steel.
- D. Heating Element: The heating element wire shall consist of 80% nickel, 20% chromium, and shall be encased in steel sheath to assure long and trouble free life. Aluminum fins shall be so designed as to block sheath radiation to front and back of heater body and pressure bonded to the steel sheath.
- E. Installation: Heaters shall be designed to permit use of supply conductors with 60°C insulation.

F. General: Navajo White or Northern White durable textured polyester powder coat finish for corrosion resistance. Linear thermal cut-out shall be factory installed to automatically shut off heater in event of overheating and reactivate heater when temperatures return to normal. The complete heater shall have a height of 6-3/4 inches and a depth of 2-7/8 inches. Heaters shall have UL approval for mounting on any floor surface including carpeting.

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.

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.
- J. Instrumentation and Controls.

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 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.

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. Instrumentation wires
 - 3. 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 for interior circuits and type XHHW-2 for exterior circuits. Exterior circuits shall be considered circuits where any portion of the circuit is run exterior of the building, in which case the entire length of the circuit shall be continuous wire of Type XHHW-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 SOUTHWIRE, PRYSMIAN GROUP, OKONITE, or approved equal.
- H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

2.02 300 VOLT INSTRUMENTATION SIGNAL CABLE - FOR INDOOR USE

- A. Indoor Application:
 - The 300-volt instrumentation signal cable for indoor use shall consist of single or multiple twisted pairs or triads of coated, stranded copper conductors with polyvinyl chloride (PVC) insulation and nylon jacket. Each individual pair or triad of wires shall have an aluminum/polyester tape shield with a tinned copper drain wire. For multiple pair or triad cables, an overall aluminum/polyester tape shield with a tinned copper drain wire shall enclose the individual wire assemblies. The overall jacket shall be PVC. Cables shall have a 105°C rating.
 - 2. The conductors shall be annealed, tin-coated copper with Class B stranding per ASTM B8. Minimum size conductor shall be AWG No. 16.
 - 3. The insulation shall be PVC. The insulation thickness shall be 15 mils.
 - 4. Individual Conductor Insulation: The jacket over each individual wire shall be nylon and shall have a thickness of 4 mils.
 - 5. The shield for each individual pair or triad shall be an aluminum/polyester tape. The shield shall be 1.35 mils thick and shall be overlapped to provide 100% coverage. The shield

shall also contain a 7-strand tinned copper drain wire which shall be a maximum of two sizes smaller than the conductors. All individual shields shall be completely isolated from each other.

- 6. The overall shield for multiple pair or triad cables shall be an aluminum/polyester tape. The shield shall be 2.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be the same size as the conductors.
- 7. The overall jacket shall be PVC and shall meet the requirements of UL 13.
- 8. The jacket thickness shall be as follows:

| Wire Size | No. of Pairs | No. of Triads | Jacket Thickness |
|-----------|--------------|---------------|------------------|
| 16 AWG | 1 | - | 35 Mils |
| 16 AWG | 2,4 | - | 50 Mils |
| 16 AWG | 8,10,12 | - | 60 Mils |
| 16 AWG | - | 1 | 35 Mils |
| 16 AWG | - | 2,4 | 50 Mils |
| 16 AWG | - | 8 | 60 Mils |
| 16 AWG | - | 12 | 70 Mils |

- 9. Manufacturers and their products shall be equal to:
 - a. BELDEN
 - b. OKONITE
 - c. SOUTHWIRE
 - d. PRYSMIAN GROUP
 - e. Or approved equal
- B. Outdoor Use in Conduits:
 - The 300-volt instrumentation signal cable for outdoor use in conduits shall consist of single or multiple twisted pairs or triads of coated, stranded copper conductors with polyvinyl chloride (PVC) insulation and nylon jacket. Each individual pair or triad of wires shall have an aluminum/polyester tape shield with a tinned copper drain wire. For multiple pair or triad cables, an overall aluminum/polyester tape shield with a tinned copper drain wire shall enclose the individual wire assemblies. The overall jacket shall be chlorinated polyethylene (CPE). Cables shall have a 105°C rating.
 - 2. The conductors shall be annealed, tin-coated copper with Class B stranding per ASTM B8. Minimum size conductor shall be AWG No. 16.
 - 3. The insulation shall be PVC. The insulation thickness shall be 15 mils.
 - 4. The jacket over each individual wire shall be nylon and shall have a thickness of 4 mils.
 - 5. The shield for each individual pair or triad shall be an aluminum/polyester tape. The shield shall be 1.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be a maximum of two sizes smaller than the conductors. All individual shields shall be completely isolated from each other.
 - 6. The overall shield for multiple pair or triad cables shall be an aluminum/polyester tape. The shield shall be 2.35 mils thick and shall be overlapped to provide 100% coverage. The shield shall also contain a 7-strand tinned copper drain wire which shall be the same size as the conductors.
 - 7. The overall jacket shall be CPE and shall meet the requirements of UL 13.
 - 8. The jacket thickness shall be as follows:

| | Wire Size | No. of Pairs | No. of Triads | Jacket Thickness |
|---|-----------|--------------|---------------|------------------|
| | 16 AWG | 1 | - | 35 Mils |
| ſ | 16 AWG | 2,4 | - | 50 Mils |
| Ī | 16 AWG | 8,10,12 | - | 60 Mils |

| Wire Size | No. of Pairs | No. of Triads | Jacket Thickness |
|-----------|--------------|---------------|------------------|
| 16 AWG | - | 1 | 35 Mils |
| 16 AWG | - | 2,4 | 50 Mils |
| 16 AWG | - | 8 | 60 Mils |
| 16 AWG | - | 12 | 70 Mils |

- 9. Manufacturers and their products shall be as follows:
 - a. BELDEN
 - b. OKONITE
 - c. SOUTHWIRE
 - d. PRYSMIAN GROUP
 - e. Or approved equal

2.03 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

2.04 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.

2.05 BELOW GRADE EXTERIOR SPLICES

- A. Manufacturer: 3M or approved equal
- B. Model: 72-N series for inline splices
- C. Model: 90-B1 for WYE splices
- D. Splices shall be weatherproof, made with epoxy resin UL listed for direct burial.
- E. For use with all exterior pull boxes and hand holes where splices are made.
- F. Provide all connectors and crimp couplings as required.

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.
 - 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

| 480V/277 Volt 3 phase | 208Y/120 Volt 3 phase (NEC) | 240/120 Volt 3 phase (NEC) |
|--------------------------|-----------------------------------|----------------------------------|
| Phase A | Phase A | Phase A |
| Brown | Black | Black |
| Phase B | Phase B | Phase B |
| Orange | Red | Orange (HiLeg) |
| Phase C | Phase C | Phase C |
| Yellow | Blue | Blue |
| Neutral | Neutral | Neutral |
| White | White | White |
| Ground | Ground | Ground |
| Green | Green | Green |

| WIRE NUMBER | COLOR | |
|-------------|---------------------|--|
| 1 | Black | |
| 2 | Red | |
| 3 | Blue | |
| 4 | Orange | |
| 5 | Yellow | |
| 6 | Brown | |
| 7 | Red With Black | |
| 8 | Blue With Black | |
| 9 | Orange With Black | |
| 10 | Yellow With Black | |
| 11 | Brown With Black | |
| 12 | Black With Red | |
| 13 | Blue With Red | |
| 14 | Orange With Red | |
| 15 | Yellow With Red | |
| 16 | 16 Brown With Red | |
| 17 | Black With Blue | |
| 18 | 18 Red With Blue | |
| 19 | 19 Orange With Blue | |

2. Control (Per ICEA Method 1, K-2):

- 3. DC Power
 - a. Positive Lead RED
 - b. Negative Lead BLACK
- 4. Instrumentation Signal
 - a. Pairs Black and White
 - b. Triads Black, Red and White
- 5. Equipment Ground GREEN
- K. Instrumentation Cable Installation:
 - 1. Where instrumentation cables are installed in panels, etc., arrange wiring to provide maximum clearance between cables and other conductors. Instrumentation cables shall not be installed in same bundle with conductors of other circuits.
 - 2. Grounding of cable shield shall be accomplished at one point only, unless otherwise required by instrumentation systems manufacturer.
 - 3. Special instrument cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

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:
 - 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.
 - 2. 300V instrumentation signal cable shall be tested from conductor to conductor, conductor to ground, and conductor to shield using a digital volt-ohm meter. The resistance value shall be 10 megohms or greater.

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:
 - 1. OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG" for connection to water main piping and Type "GC" for connection to ground rod; with cable installed parallel or 90 degrees to pipe/rod under separate clamp.
 - 2. 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: Solid 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.

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.

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 and below ground.
 - 2. Conduit Use Electrical Metallic Tubing (EMT) Conduit:
 - a. All interior circuits above ground.
 - b. All circuits concealed in CMU walls.
 - 3. Conduit Use Metal Clad (MC) Cable:
 - a. All 15 and 20 amp branch circuits concealed in ceilings.
 - 4. 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.
 - 5. 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 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.
- 2.03 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.
- 2.04 DUCT SEAL
 - A. RectorSeal or approved equal.
 - B. Model #: 81881
- 2.05 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.

2.06 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.

2.07 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 feralloy. Provide gasketed cover by box manufacturer.

2.08 FLOOR BOXES

- A. MANUFACTURER: Legrand EVOLUTION series, or approved equal.
- B. FINISH: To match surrounding floor finish. Coordinated with Contract 'G' as required.
- C. CAPACITY: Minimum of 4 gangs of capacity for wiring devices.
- D. FEATURES:
 - 1. Separation of power and data wiring to eliminate interference.
 - 2. Fire rating where indicated on drawings.
 - 3. UL listed.
- E. DEVICES: Refer to floor plans for quantity of devices at each floor box location.

2.09 POKE-THRU FLOOR BOXES

- A. MANUFACTURER: Legrand EVOLUTION series 6-inch Poke-Thru, or approved equal.
- B. FINISH: To match surrounding floor finish. Coordinated with Contract 'G' as required.

C. CAPACITY: Minimum of 3 gangs of capacity for wiring devices.

D. FEATURES:

- 1. Separation of power and data wiring to eliminate interference.
- 2. Fire rating where indicated on drawings.
- 3. UL listed.
- E. DEVICES: Refer to floor plans for quantity of devices at each floor box location

2.10 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".

2.11 JUNCTION BOXES

- A. Acceptable Manufacturers: RACO, GENERAL ELECTRIC or approved equal.
- B. Sheet metal boxes: NEMA OS1, galvanized steel.
- C. Covers: Galvanized steel.

2.12 ELECTRICAL HANDHOLE

- A. Acceptable Manufacturer: Jensen precast, Quazite, or approved equal..
- B. Handhole shall be H-20 traffic rated.
- C. Cover shall have 3" high "ELECTRIC" logo.
- D. Fully Gasketed Watertite Frame & Cover.

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. Conduits shall not be installed within concrete slabs unless specifically noted in contract documents; no exceptions.
- 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. All boxes, conduit bodies, and handholes shall be installed in a manner which meets the accessible and readily accessible reuirements of the NEC, including in building with suspended ceilings and hold down clips.
- F. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.
- G. 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.
- H. 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.
- I. 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.
- J. 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.

- K. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.
- L. Effectively close unused openings in boxes with metal plugs or plates.
- M. Set boxes so that front edges are flush with finished surfaces.
- N. Support boxes from structural members with approved braces.
- O. Install blank device plates on outlet boxes left for future use.
- P. Provide bushings in holes through which cords or conductors pass.
- Q. Install boxes so that the covers will be accessible at all times.
- R. 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

- 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. J-Hooks are only permitted to be used above finished ceilings for telephone, PA, CAT 6 data and fire alarm cable.
- C. Contractor shall not route conduits over pump motors, roof hatches and trolly beams which would prevent removal of pump motors.

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 SUBMITTALS.
- 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 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.

1.01 SECTION INCLUDES

- A. Surge protection device.
- 1.02 RELATED SECTIONS

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. 400LS.

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. 400,000 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:

| Voltage: | Description: | Joules (8/20us): | Vpeak L-N (20kV, 10kA): | Vpeak L-N (6kV, 3KA): |
|-------------|--------------------------|---------------------|----------------------------|--------------------------|
| 120/208 VAC | 3phase, 4W + gnd, wye | 26,496 | 600V | 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 400 kA. The surge life (8/20us) shall be at least 10,000 @ 15 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 200 kA, 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: 400LS-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. Units shall be installed as close as possible to the load side lugs of the transfer switch to which it is connected using low impedance Micro-Z cabling.
- B. 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

2/25/2025 4:21 PM

1.01 SECTION INCLUDES

- A. Distribution panelboards.
- B. Retrofit 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, auto-dial 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.

1.01 SECTION INCLUDES

- A. Switches, receptacles, thermostats, device plates and other wiring devices as indicated on Drawings.
- 1.02 REFERENCES
 - A. ANSI/NFPA 70 National Electric Code.
 - B. NEMA WD1 General Purpose Wiring Devices.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Provide manufacturer's catalog information showing dimensions, colors and configuration.

1.04 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.
- F. Tamper-Resistant Receptacles: All receptacles in areas specified below shall be listed tamper-resistant receptacles:
 - 1. Dwelling units
 - 2. Guest rooms and guest suites of hotels and motels
 - 3. Child care facilities
 - 4. Preshchools and elementary education facilities
 - 5. Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities
 - 6. Public assembly occupancies
 - 7. Dormitories

8. All areas required by NFPA 70 NEC

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 LINE VOLTAGE THERMOSTAT

- A. Acceptable Manufacturers: HONEYWELL, Model No. T651A3018, T675A (for elev shaft), or approved equal.
- B. Heating/Cooling Rated
- C. Ratings: 120 volts, 22 amps resistive SPDT switch.
- D. Temperature Range: +44° to + 86° F.

2.05 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.

2.06 CONTACTORS

- A. Manufacturers: Square D, Model No. LO1000V02.
- B. 4 pole, 30 amp, open type contactor.
- C. Electrically held coil, 120VAC.
- D. Quantity required: Two (2)

2.07 TIMER

- A. Manufacturer: NSi Industries, Model Tork DG100A, DG200A, or approved equal.
- B. Voltage Rating: 120-277VAC
- C. Output Contacts: DPDT
- D. Contact rating: Resistive Load: 20A (NO) 10A (NC); Motor Load: 1HP (NO), 1/4HP (NC).
- E. Timing Accuracy: Line Frequency.
- F. Operating Temp -31 deg F to 131 deg F (-35 deg C to +55 deg C).

2.08 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 Owner.

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.

1.01 SECTION INCLUDES

- A. Disconnect switches.
- B. Enclosed Circuit Breakers.

1.02 REFERENCES

- A. NEMA KS-1 Enclosed Switches.
- B. ANSI/UL 198C High Intensity Capacity Fuses, Current Limiting Types.
- C. FS W-S 865 Switch, Box (Enclosed), Surface Mounted.
- D. 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 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: 600VAC
- 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. Enclosures: Refer to drawings.

2.02 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. 1000Amp, 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 4X Stainless Steel (for exterior use).
 - 3. External Throw.
 - 4. Suitable for Service Entrance Equipment (where applicable).

2.03 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.

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.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Magnetic motor starters.

1.02 REFERENCES

- A. NFPA 70 National Electrical Code.
- B. NECA "Standard of Installation," published by National Electrical Contractors Association.
- C. NEMA ICS 2 Industrial Control Devices, Controllers and Assemblies.
- D. NEMA ICS 6 Enclosures for Industrial Controls and Systems.
- E. NEMA KS 1 Enclosed Switches.

1.03 SUBMITTALS

- A. Refer to drawing for starter sizes on schedules.
- B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- C. Test Reports: Indicate field test and inspection procedures and test results.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NEMA ICS 2.3.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. SIEMENS, Class 17
- B. Franklin Control Systems (for 1-phase load) or approved equal.
- C. Substitutions: Under provisions of Section 012500

2.02 AUTOMATIC CONTROLLERS

A. Combination Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

- B. Motor starters shall be NEMA rated.
- C. Coil operating voltage: Coordinate voltage required with equipment to be installed and associated contactor(s).
- D. Auxiliary contacts: NEMA N/O and N/C contacts rated up to 10 Amp. SIEMENS Model No. 49AAFO and 49AAFC.
- E. Overload Relay: NEMA ICS; melting alloy overload.
- F. Enclosure: As shown in contract drawings.
- G. Circuit Breaker Disconnect Switch with external lockable handle.

2.03 PRODUCT OPTIONS AND FEATURES

- A. Auxiliary Contacts: NEMA ICS 2, 1 each normally open/closed contacts.
- B. Motor running and overload indication lights. Pilot lights shall be heavy duty 30.5 mm oiltight press-to-test by SIEMENS or equal.
- C. Selector Switches: Hand-off-automatic selector switch shall be heavy duty 30.5 mm oiltight by SIEMENS or equal.
- D. Manual reset push button for overload.

2.04 STARTER TYPE "S2"

- A. Manufacturer: Franklin Control Systems, Model BAS-1P or approved equal.
- B. Motor starters shall be NEMA rated.
- C. Output Horsepower: 1HP.
- D. Maximum Current: 16A
- E. Coil operating voltage: Coordinate voltage required with equipment to be installed by other contractor(s).
- F. Overload Relay: NEMA ICS; melting alloy overload.
- G. Enclosure: As shown in contract drawings.
- H. Options and Features
 - 1. Auxiliary Contacts:
 - a. Fault Output
 - b. Status Output
 - 2. Motor running and overload indication lights.
 - 3. Selector Switches: Hand-off-automatic selector switch.
 - a. Manual reset push button for overload.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install enclosed controllers size as indicated, on starter schedule, in accordance with manufacturer's instructions.
- B. Install enclosed controllers plumb in locations indicated on drawings. Provide supports in accordance with Section 260526.
- C. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- D. Provide engraved plastic nameplates for each starter.
- E. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor and voltage/phase rating.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Automatic transfer switch.

1.02 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.

1.03 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.

1.04 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.

1.05 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.

1.06 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 ASCO 300 Series automatic delayed transfer switch (3ATS).
- B. The 3ADTS shall transfer the load in delayed transition (break before make) mode. Transfer is accomplished with a user – defined interruption period in both directions, (see 3.03 time delays for adjustment range).
- C. 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.
- D. 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 ASCO 300 Series. Substitute equipment shall be field verified for adequate equipment spacing relative to other equipment to be installed in the same locations.
- E. 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 transfer switch unit shall be electrically operated and mechanically held. The electrical operators shall be dual-solenoid mechanisms, momentarily energized. Main operators which include over current disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.
- C. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- D. All main contacts shall be silver composition. Switches rated 800 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

- F. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- G. Where neutral conductors must be switched, the ADTS shall be provided with fully- rated neutral transfer contacts.
- H. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided

2.03 GROUP 'G' CONTROLLER WITH INTEGRAL USER INTERFACE PANEL

- A. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.
- B. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, inherent serial communications capability, and the ability to communicate via the Ethernet through optional communications module
- C. C. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to \pm 1% of nominal voltage. Frequency sensing shall be accurate to \pm 0.1Hz. Time delay settings shall be accurate to \pm 0.5% of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to + 70 degrees C, and storage from -55 to + 85 degrees C.
- D. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards.
- E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 - IEC 60947 6 1Multiple Function Equipment Transfer Switching Equipment, 61000-4 Testing And Measurement Techniques - Overview
 - a. IEC 61000 4 2 Electrostatic Discharge Immunity
 - b. IEC 61000 4 3 Radiated RF Field Immunity
 - c. IEC 61000 4 4 Electrical Fast Transient/Burst Immunity
 - d. IEC 61000 4 5 Surge Immunity
 - e. IEC 61000 4 6 Conducted RF Immunity
 - 2. CISPR 11 Conducted RF Emissions and Radiated RF Emissions

2.04 ENCLOSURE

- A. The 3ADTS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.
- B. Controller shall be mounted on, visible, and operational through enclosure door

PART 3 OPERATIONS

3.01 CONTROLLER DISPLAY AND KEYPAD

- A. A 128*64 graphical LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller
 - 1. Nominal line voltage and frequency.
 - 2. Single or three phase sensing on normal.
 - 3. Transfer operating mode configuration, (open transition, or delayed transition)
- B. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.02 VOLTAGE AND FREQUENCY SENSING

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup,dropout, and trip settings capabilities (values shown as % of nominal unless otherwise specified.

| Parameters | Sources | Dropout/Trip | Pickup/Reset |
|---|-------------------------|--------------------------------------|---|
| Undervoltage Overvoltage Underfrequency | N & E N & E N & E | 70 to 98% 102 to116% 85 to 98% | 85 to 100% 2% below trip 86 to 100% |
| Overfrequency | N & E | 101 to 111% | 2% below trip |

- B. Repetitive accuracy of all settings shall be within 1% at +25°C.
- C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.
- D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage and frequency. Note: Single phase on emergency
- E. The backlit 128*64 graphical display shall have multiple language capability. Languages can be selected from the user interface

3.03 TIME DELAYS

- A. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.
- B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.
- C. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.

- D. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
- E. A cooldown time delay shall be provided on shutdown of engine generator, adjustable 0 to 60 minutes 59 seconds.
- F. All adjustable time delays shall be field adjustable without the use of special tools.
- G. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:
 - 1. . Prior to transfer only.
 - 2. 2. Prior to and after transfer.
 - 3. 3. Normal to emergency only.
 - 4. 4. Emergency to normal only.
 - 5. 5. Normal to emergency and emergency to normal.
 - 6. 6. All transfer conditions or only when both sources are available
- H. In the event that the alternate source is not accepted within the configured Failure to Accept time delay, the common alert shall become active.
- I. The controller shall also include the following built-in time delay for To delayed transition transfer operation.
 - 1. A time delay for the load disconnect position for delayed transition operation adjustable 0 to 5 minutes 59 seconds in 1 second increments.

3.04 ADDITIONAL FEATURES

- A. The user interface shall be provided with soft keys for the test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.
- B. A set of contacts rated 5 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down. setting, regardless of whether the normal source restores before the load is transferred.
- C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ADTS is connected to the normal source and one contact closed when the ADTS is connected to the emergency source.
- D. A single alarm indication shall light up the alert indicator, and de energize the configured common alarm output relay for external monitoring.
- E. LED indicating lights shall be provided; one to indicate when the ADTS is connected to the normal source (green) and one to indicate when the ADTS is connected to the emergency source (red).
- F. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.
- G. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.

- H. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).
- I. Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- J. An engine generator exercising timer shall be provided to configure weekly and bi- weekly automatic testing of an engine generator set with or without load for 20 minutes fixed. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.
- K. Terminals shall be provided for a remote contact to signal the ADTS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency This inhibit signal can be activated through the keypad or serial port.
- L. System Status The controller LCD display shall include a "System Status" screen which shall be readily accessible from any point in the menu by depressing the "ESC" key. This screen shall display a clear description of the active operating sequences and switch position. For example:
 - 1. Normal failed
 - 2. Load on Normal
 - 3. TD Normal to Emergency: 2mins15s
 - 4. Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual are not permissible
- M. Self Diagnostics The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed
- N. Communications Interface The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.) Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.
- O. Data Logging The controller shall have the ability to log data and to maintain the last 300 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non volatile memory.
 - 1. Event Logging
 - a. Data and time and reason for transfer normal to emergency
 - b. Data and time and reason for transfer emergency to normal
 - c. Data and time and reason for engine start
 - d. Data and time engine stopped
 - e. Data and time emergency source available
 - f. Data and time emergency source not available
 - 2. Statistical Data
 - a. Total number of transfers
 - b. Total number of transfers due to source failure
 - c. Total number of day's controller is energized
 - d. Total number of hours both normal and emergency sources are available
 - e. Total time load connected to normal
 - f. Total time load connected to emergency
 - g. Last engine start
 - h. Last engine start up time
 - i. Input and output status

- P. Accessory Package An accessory bundle shall be provided that includes:
 - 1. A fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without load on a daily weekly, bi weekly, or monthly basis.
 - 2. Event log display that shows event number, time and date of events, event type, and reason (if applicable). A minimum of 300 events shall be stored.
 - 3. RS 485 communications port enabled.
 - 4. Common alarm output contact.
- Q. Expansion Module A relay expansion module (REX) is a standard feature when delayed transition transfer is specified. A REX module shall also be provided for open transition transfer that includes one form C contact for source availability of the normal (18G) and emergency (18B) sources. Additional output relay shall be provided to indicate a common alarm. The REX module shall have the capability of being daisy chained for multiple sets of contacts. (This feature shall be equal to ASCO accessory 18RX, and shall be capable of being added to existing switches without modification).
- R. Current Sensing Card A load current metering card shall be provided that measures either single or three phase load current. It shall include current transformers (CT's) and shorting block. Parameters shall be able to be viewed via the user interface. (This feature shall be equal to ASCO accessory 23GA (single phase), 23GB (three phase), and shall be capable of being added to existing switches without modification).
- S. Transfer Alarm An audible alarm with silencing feature shall be provided to signal each time transfer to emergency occurs. (This feature shall be equal to ASCO accessory 62W).
- T. Power Meter (This feature shall be equal to ASCO accessory 135L, or feature bundle accessory 150*). The Power Meter shall conform to the requirements of:
 - 1. UL 3111-1-Electrical Measuring and Testing Equipment
 - 2. CAN/CSA-C22.2 No. 23-M89-CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment
 - 3. The Power Meter shall be capable of operating without modification at a nominal frequency of 45 to 66Hz.
 - 4. The Power Meter shall be rated for an operating temperature of -4°F to 158°F and a storage temperature of -22°F to 176°F. and shall be rated for an 85% non-condensing, relative humidity.
 - 5. The Power Meter shall accept inputs from industry standard instrument transformers (120 VAC secondary PT's and 5A secondary CT's). Direct phase voltage connections, 0 to 600VAC nominal, shall be possible without the use of PT's.
 - 6. The Power Meter shall accept single, 3 phase, or three & four wire circuits. A fourth CT input shall be available to measure neutral or ground current.
 - 7. The Power Meter shall contain a built-in discrete contact to wire an ATS 14A auxiliary contact to indicate switch position.
 - 8. The Power Meter shall accept AC voltage from the sensing lines for operation. Additional provisions shall be provided for external DC voltage input range 9-36 VDC with a nominal of 24 VDC.
 - 9. The Power Meter shall be equipped with a continuous duty, long –life, 4 line x 20 character green backlit LCD
 - 10. All setup parameters required by the Power Meter shall be stored in non-volatile memory and retained in the event of a control power interruption
 - 11. The Power Meter shall be flush mountable on a surface.
 - 12. The Power Meter enclosure shall be sealed to IP-51 (NEMA 1) and the faceplate shall be sealed to IP-65 (NEMA 4). All push buttons shall be sealed tact switches.
 - 13. The Power Meter shall send, when prompted, information to a central location equipped with a manufacturer supplied critical power management system or 3rd party monitor

through manufacturer supplied communication modules. All 3rd party monitor must utilize industry standard open protocols Modbus/RTU.Modbus/TCP or SNMP

- An embedded RS-485 port will be provided which will enable communication at 9600, 19.2K, 38.4K, or 57.6K baud. DIP switches will be provided on the RS-485 port allowing a user to select 2-wire or 4-wire communication as well as the option to activate a terminating resistor on the port.
- 15. The Power Meter shall help facilities comply with NEC 220. It shall provide Maximum Demand calculations for the past 24 months, as per standards with 15 minute averages.
- 16. The following data will be available on the display and Modbus registers of the Power Meter:
 - a. Line-to-neutral voltages (VAN, VBN, and VCN)
 - b. Line-to-neutral voltage average (VAVE)
 - c. Line-to-line voltages (VAB, VBC, and VCA)
 - d. Line-Line voltage average (VLAVE)
 - e. Current on each phase (IA,IB,and IC)
 - f. Current on the neutral conductor (IN)
 - g. Average current (IAVE)
 - h. Active power, KW per phase and total (WA,WB,WC, and WT)
 - i. Apparent power, KVA per phase and total (VAA, VAB, VAC, and VAT)
 - j. KWHours importing, exporting and net (KWHIMP, KWHEXP, and KWHNET)
 - k. KVARHours leading, lagging and net (KVARHLEAD, KVARLAG, and KVARHNET)
 - I. Power factor (PF)
 - m. Signal Frequency (Hz)
 - n. Digital Input
- 17. The Power Meter shall offer an LCD which can display no less then nine different languages.
- 18. Displaying each of the metered values shall be done through the use of menu scroll buttons. There will be an escape button which will be used to take the user back to the previous page or to cancel a setting change. Pressing escape no more than three times will return the user to the home screen.
- 19. For ease of operator viewing, the display can be configured to remain on continuously, with no detrimental effect on the life of the Power Meter.
- 20. The display's contrast shall be configurable in intervals of 10% (ranging 0%-100%).
- 21. Setup of a system requirements shall be allowed from the front of the Power Meter.

PART 4 - ADDITIONAL REQUIREMENTS

4.01 WITHSTAND AND CLOSING RATINGS

A. The ADTS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ADTS terminals with the type of overcurrent protection shown on the plans. WCR ADTS ratings shall be as follows when used with specific circuit breakers:

ADTS SIZE WITHSTAND 7 CLOSING W/CLF RATING MCCB (240V/60Hz)

1000 65,000A 200,000

B. TEST AND CERTIFICATION

1. The complete 3ADTS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

- 2. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
- 3. The ADTS manufacturer shall be certified to ISO 9001: 2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001: 2008.

4.02 SERVICE REPRESENTATION

- A. The ADTS manufacturer shall maintain a national service organization of company- employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- B. The manufacturer shall maintain records of switch shipments, by serial number, for a minimum of 20 years.
- C. For ease of maintenance, the transfer switch nameplate shall include drawing numbers and serviceable part numbers.

PART 5 - EXECUTION

5.01 INSTALLATION

A. Installation of transfer switches shall be in accordance with manufacture requirements. Provide applicable U.L. labeling for installed system.

5.02 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.

5.03 DEMONSTRATION

A. Demonstrate operation of transfer switch under provisions.

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 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.

1.03 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 dia-grams.
- 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 applica-tion 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.

1.04 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.
- 1.05 QUALITY ASSURANCE
 - A. Perform work in accordance with NFPA 110.

1.06 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.

1.07 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.

1.08 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 C250N6 and shall be rated by the manufacturer for standby operation at 250 KW/312 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 1000 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.
 - 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.5% 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 197 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 9% and a maximum frequency dip of 5%.

| Step No. 1 | Description Misc. Load Lighting Load | Load 20KVA 5 kW | Volts/ Phase 120/1 120/1 | Motor Code | Load Type Misc. Load Lighting Load | Starting Method Full Voltage Full Voltage |
|--|--|---|--|-------------------------|--|--|
| | General Rec Load | 10 KVA | 120/1 | | Misc. Load | Full Voltage |
| 2 | GXF-1 GXF-4 GXF-5 GXF-6 GXF-7 GXF-8 GXF-9 GXF-11 GXF-12 GXF-12 GXF-14 AC-1 Dish Washer | 1/6 HP 1/4 HP 1/4 HP 1/10 HP 1/10 HP 1/10 HP 1/4 HP 3/4 HP 3/4 HP 1/4 HP 5 HP 9.73 | 115/1 115/1 115/1 115/1 115/1 115/1 115/1 115/1 115/1 115/1 208/3 208/3 | P P P R R R P P L P J K | Motor Motor Motor Motor Motor Motor Motor Motor Motor Motor Motor Motor | Full Voltage Full Voltage |
| | Ice Cream Machine Gear Washer Gear Dryer MAU-1A MAU-1B KX-1 | 2.5KVA 2.21 HP 16A 1 HP 1 HP 1.5 HP | 208/1 208/1 115/1 208/3 208/3 208/3 | L L N N | Motor Motor Motor Motor | Full Voltage Full Voltage Full Voltage Full Voltage Full Voltage |
| 3 | DOAS-1 GXF-2 Misc AC Load | 5 Tons 2 HP 11A | 208/3 208/1 120/1 | L | AC Load Motor | Full Voltage Full Voltage Full Voltage |
| 4 | EV Charging Station | 19.2 KVA | 208/1 | | | Full Voltage |
| 5 | DSEU-3 | 0.75 Tons | 208/1 | М | AC Load | Full Voltage |
| 6 7 8 9 10 11 12 13 | DSEU-2 DSEU-1 RTU-A RTU-B CU-3 CU-2 CU-1 SCBA Compressor | 1.5 Tons 1.5 Tons 6 Tons 14 Tons 8 Tons 14 Tons 14 Tons 14 Tons 20 HP | 208/1 208/3 208/3 208/3 208/3 208/3 208/3 208/3 | L L H G G G G K | AC Load AC Load AC Load AC Load AC Load AC Load AC Load Motor | Full Voltage Full Voltage Full Voltage Full Voltage Full Voltage Full Voltage Full Voltage |
| 14 | Elevator | 10 HP | 208/3 | К | Motor | Full Voltage |
| | | | | | | |

| Step | | | Volts/ | Motor | Load | Starting |
|------|-------------|------|--------|-------|------|----------|
| No. | Description | Load | Phase | Code | Туре | Method |

- 10. The generator shall at a minimum provide the following performance:
 - a. The generator as a packaged unit (engine, alternator and controls) provide a minimum of 1,470 SKVA.
 - b. The alternator performance shall be designed to provide a minimum of 1,050 locked rotor KVA at a maximum voltage dip of 35%.
 - c. Contractor shall provide and install one (1) zero to thirty minute time delay relay for each piece of mechanical equipment listed in the generator list of loads appendix. Contractor shall integrate time delay relay with start/stop signal of associated equipment, and install time delay relay in accordance with each mehcanical equipment manufacturer's installation instructions. Exact time delay setting for each relay shall be coordinated during installation and start-up of mechanical equipment and generator such that mechanical equipment is started and stopped in accordance with the steps listed in the generator list of loads appendix.
- B. The following performance verifications shall be provided for substitute generators.
 - 1. Submit digital copy f 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. Generator sizing program shall be submitted to engineer for 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, 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 amortissuer (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 80 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 staring, 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. The generator control panel shall provide a network interface for the future Scada System. This network interface shall communicate all the generator status, control, display messages, troubleshooting and safety features as described below. Software shall be available for interfacing PLC Software with generator control panel communications. This interface and software development will be performed by another contract.
 - 2. 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.
 - 3. 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.
 - 4. 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.
 - 5. 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.
 - 6. 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)
 - I. 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)
 - 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.
- 7. Engine Status Monitoring: The following information shall be available from a digital status panel on the generator set control:
 - a. Engine Oil Pressure (psi of 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)
- 8. 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.
- 9. 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.
- 10. 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 855 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 33,250 scfm. The maximum alternator cooling air shall not exceed 1,463 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, 70 ampere and solid-state voltage regulators.
 - 5. Anti-condensation heater for alternator.
 - 6. Power distribution panel shall be provided as specified on drawing(s). All electrical power distribution panels shall be provided as per associated panel schedule on drawing(s). All termination lugs and bus bars shall be constructed of tin-plated copper.

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 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 2500 watts. Input voltage of heaters shall be 120V, 1-phase.
- E. Provide generator 20 light remote annunciator located inside the Treatment Building 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.

2.11 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 73.4 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.

2.12 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 torisional 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.

2.13 WARRANTY

A. Provide a 5-year manufacturer's limited warranty, including 100% parts and labor, ONAN Option L031. 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 rep-resentative 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 stabiliza-tion 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.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Self-contained, free-standing load bank.
- B. Unit controller and malfunction detection system.

1.02 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Provide wiring schematic, dimension drawing.

PART 2 - PRODUCTS

2.01 STATIONARY LOAD BANK

- A. Load Capacity: 1.0 power factor, as manufactured by Avtron, Model SPIRIT.
- B. Ratings: 125 KW.
- C. Load Steps as a Minimum: 1/4, 1/2, 3/4, full.
- D. Voltage: 208 V AC, 3 phase, 4 wire.
- E. Frequency: 60 Hertz.
- F. Ambient Temperature: 120 degrees F maximum.
- G. Duty Cycle: Continuous.

2.02 ENCLOSURE

- A. The load bank enclosure shall be NEMA Type 3R, designed for outdoor installation on a concrete pad.
- B. The load bank enclosure shall be of double wall construction for cool exterior and thermal isolation of the load elements.
- C. Cooling airflow through the enclosure shall be vertical with cold air intake at the bottom and hot air exhaust out the top. Intake and exhaust openings shall be screened.
- D. The enclosure shall include forklift channels and lifting eyes.
- E. Load Elements: Open, helically wound, chromium alloy electrical resistance wire derated to operate at 50% of the maximum continuous temperature rating of wire. Element wire to be mechanically supported over entire length in such a way that should a wire break, the broken wire segments will not short to adjacent conductors or to ground.
- F. Load elements are to be individually serviceable and replaceable in the field without major disassembly of the load bank. An acceptable design to satisfy this requirement is the installation of the load elements in slide-out, removable trays in such a way that any element is easily accessed without disturbing any other elements.
- G. All materials used in the mounting and installation of the load elements shall be suitable for the temperatures encountered, both in normal operation and under fault conditions.

- 1. Materials in direct contact with the element wire shall be ceramic. These ceramics shall be installed upon and reinforced and supported by stainless steel
- 2. Other materials which structurally support the load elements and/or form the hot air duct within which the elements are mounted shall be steel, stainless steel or aluminum.
- 3. Plastics and glass reinforced plastic materials and flammable materials are not acceptable materials of construction for installation, support and mounting of load elements or in the construction of the load bank hot air duct.
- H. Load Element Short Circuit Protection: The resistive load shall be fused in branch circuits of not more than 50 KW each. Load circuit fuses shall be 200,000 A.I.C. current limiting type, extremely fast acting, 600v rated.
- I. Load Control: One magnetic contactor per each fused branch circuit.
- J. Load Power Wiring: 150 degrees C insulated.
- K. Main Terminals: Copper, 1000A per square inch.
- L. Cooling System: Forced air cooled by motor direct drive propeller fan. Motors shall be TEFC, 1800 RPM maximum, and controlled by a circuit breaker combination motor starter.
- M. Cooling fan and control power shall be derived internally from the main load bus. The cooling fan shall operate at AC line voltage. Load control circuits and fan motor control shall operate at 120V and control logic at 24V via control power isolation transformers. Control circuits shall be fused. Control circuit fuses shall be 200,000 A.I.C. current limiting type, 600V rated.
- N. Provide overvoltage protection.
- O. Provide anti-condensation internal space heaters with humidistat control.
- P. Load bank shall have a load dump feature. The contacts from the transfer switch when in the emergency position shall lock-out the load bank from operating.

2.03 LOAD BANK CONTROLLER

- A. Power supply for load bank control circuits.
- B. Malfunction detection system consisting of sensors within the load bank, load bank, enable/disable permissive circuit and alarms. Malfunction detection sensors to include cooling air intake temperature switch set at 120 degrees F, exhaust air temperature switch set at not more than 75 degrees F above the maximum rated temperature rise and an air pressure switch to sense for loss of cooling airflow.
- C. Cooling fan automatic start-stop control.
- D. Remote load dump circuit to trip load bank off-line from remote contacts. A manual bypass switch shall be provided to override the remote contacts.
- E. Input/output devices and control circuits for operation of load bank from remote devices when in "automatic" mode or "remote" mode.
- F. Auxiliary dry contacts for field use to indicate load bank "operating normally" and "load bank failure".
- G. Manual control panel consisting of:

- 1. Mode selector switch to select the following: "Off", "Local-Manual", "Local-Auto" and "Remote".
- 2. Manual "run" and "stop" pushbuttons.
- 3. Switch to bypass remote load dump contacts.
- 4. Master load control switch.
- 5. Load step control switches, one for each load step.
- H. Status annunciator with visual indicators for the following:
 - 1. Power connected to load bank.
 - 2. Load bank running in local-manual mode.
 - 3. Load bank running in local-auto mode.
 - 4. Load bank running in remote mode.
 - 5. Remote load dump activated.
 - 6. Load dump bypassed.
 - 7. Load bank operating normally.
 - 8. Load bank disabled due to cooling failure.
 - 9. Master load switch on.
 - 10. Load step on (one for each load step).

2.04 AUTOMATIC LOAD BANK CONTROLLER

- A. The load bank is to be equipped with an automatic controller which will be activated when the load bank mode control selector switch is placed in the "automatic" position.
- B. In automatic mode, the load bank is to be on-line and continuously operative whenever the power source runs. The load bank shall provide a component of the total power source load and shall be automatically variable in response to dynamic total load demands upon the power source.
- C. The automatic controller shall include control logic, solid state sensors and time delays which shall act to apply/remove load bank component in multiple steps in response to dynamic output of the power source.
- D. The automatic controller shall function to maintain total load upon the power source within a preset bandwidth by adding load bank load component as external load component drops and removing load bank component as external load rises.
- E. The automatic controller shall sense load (kilowatts).
- F. Full manual control of the load bank shall be restored when the mode selector switch is placed in the "manual" position.
- G. The automatic controller shall include a solid state load sensor with level and time delay adjustment and output contacts for each load step. A current transformer for external installation shall be provided.

2.05 WARRANTY

A. Provide a 5-year manufacturer's limited warranty, including 100% parts and. The complete system, including but not limited to 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. Supplier must be factory authorized to perform warranty service on the entire system.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of concrete pad.
- B. Install load bank outdoors on concrete pad.
- C. Provide all power and control wiring to load bank from generator and automatic load bank controller and transfer switch. Provide control contacts and circuit from transfer switch when transfer switch is in emergency position which will dump the load bank.

3.02 TESTS

- A. Initial startup and field acceptance tests are to be conducted by an authorized representative of the system manufacturer who supplied the equipment.
- B. Test load bank under full load at the time of the generator test.

1.01 SECTION INCLUDES

- A. Interior and exterior luminaries and accessories.
- B. Emergency lighting and units.

1.02 REFERENCES

- A. NEMA WD 6 Wiring Devices Dimensional Requirements.
- B. NFPA 70 National Electric Code.
- C. NFPA 101 Life Safety Code.
- D. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products
- E. 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. Five (5%) percent of additional fixtures for each type specified on the light fixture schedule with a minimum of one (1) fixture.

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. Flourescent Minimum 0.125" thick and to be virgin acrylic.
 - 2. Low voltage Tempered glass, to enclose lamp.
- F. VOLTAGE: As noted on the lighting fixture schedule. Contractor is responsible for field verifying available voltage(s) and ordering fixtures, ballasts, and transformers accordingly.
- G. 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.

H. 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 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 luminaries 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

- M. Stem-mounted fixtures are to be mounted to be absolutely vertical or horizontal. Install suspended luminaries 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 luminaries using accessories and firestopping materials to meet regulatory requirements for fire rating. In fire rated ceilings, recessed luminaries must carry one-hour UL fire rating classification.
- O. Install all accessories specified with each fixture. Install recessed luminaries 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. Replace LED luminaries that have failed at completion of project.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Main CB/current transformer/meter cabinet and meter pan.
- B. Transformer to be mounted on a reinforced concrete pad/pull box.
- C. Primary and secondary conduits, conductors, excavation, concrete and backfill.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 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, Current Transformers and Ground Fault Protection shall be as per Local Utility specifications.

2.02 COMBINATION TRANSFORMER PAD/PULL BOX

- A. Combination transformer pad/pull box shall be as per Local Utility requirements.
- B. Conduit penetrations shall be provided for both primary and secondary penetrations into transformer and into pull box so that minimum ground cover is maintained in accordance with NEC and Local Utility requirements. Enter primary and secondary conduits/conductors into transformer pullbox in accordance with Local Utility requirements.

2.03 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 TS for all primary services and secondary services above 400 amperes.

2.04 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 cubicle of motor control center, coordinate service requirements with Local Utility prior to commencing work.
- C. All metering equipment and ground fault protection shall be factory installed in motor control center.
- D. Contractor shall file application for new electrical service. Contractor shall coordinate with owner for all information related to the service application.

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 require-ments.
- 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 dur-ing all phases of work, day and night.
- 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 replace at no cost to the Owner.
- E. Provide temporary lighting for new Fire House. 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 the Fire House and Architect/Engineer's 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 othe Contractors.
- H. Wiring for temporary light, controls and power shall include a distribution panel for 4 wire, 120/240 volt, 200 AMP service. Feeders in building shall have branch circuits of #12

H2M

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.

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. Addressable Multi-Criterion Detector with Sounder Base.
- L. Addressable Heat and Carbon Monoxide Detector with Sounder Base.

1.02 REFERENCES

- A. NFPA 70 National Electrical Code.
- B. NFPA 72, 72G, 72H National Fire Alarm Code.
- C. NFPA 101 Life safety code.

1.03 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.
 - 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.

1.04 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 annuniciator 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 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 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.

1.05 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.

1.06 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.

1.07 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.

1.08 EXTRA MATERIALS

- A. Furnish under provisions of Section 017839.
- B. Provide five (5) of each type of automatic smoke detector.
- C. Provide three (3) of each type of automatic heat detector.
- D. Provide five (5) of each type of notification appliance.
- E. Provide five (5) of each type of pull station.
- F. Provide two (2) multi-criterion detectors with sounder bases.
- G. Provide two (2) heat/CO combinaton detectors with sounder bases.

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.
 - 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 $\frac{3}{4}$ 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
 - 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
 - The FACP central processing unit (CPU) shall provide for the monitoring of addressable, 1 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.
 - 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 EST3 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.
 - I. 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 from 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. 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 inidicators 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) captivee 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-deq 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 MULTI-CRITERION DETECTOR WITH SOUNDER BASE

A. Manufacturer: Edwards

- 1. Model: SIGA-OSHCD
- 2. Accessories: SIGA-AB4GT With SIGA-TCDR (Temporal '4' Pattern Generator)

2.11 HEAT AND CARBON MONOXIDE COMBINATION DETECTOR

- A. Manufacturer: Edwards
 - 1. Model: SIGA-HCD
 - 2. Accessories: SIGA-AB4GT With SIGA-TCDR (Temporal '4' Pattern Generator)

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 Owner 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. Owner 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 3.03 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 a smoke detector tester.
 - 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 fans. All ducted equipment rated 2000 CFM or greater shall have 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 and relays; 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 ELEVATOR RECALL

- A. The contractor shall provide all new elevator controls as required to provide elevator recall and interface with new fire alarm control panel. Contractor shall engage the services of a qualified elevator contractor to provide controls that upon smoke detection (detector located adjacent to elevator) on the primary floor, the elevator shall go to the alternate floor and remain there until manually reset or if the fire department override key is used. If smoke detection (detectors located on any floor other than the primary floor) the elevator shall go the primary floor and remain there until manually reset or if the fire department override key is used.
- B. Provide all new controls, accessories, wiring, conduit and control modules as required.
- C. Provide all new controls, to interface elevator control panel, fire alarm controls, wiring and programming panel, shunt trip breakers and operation of sprinkler solenoid valves in shaft.
- D. Contractor shall submit control wiring drawings for Architect/Engineer review.

3.10 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.

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.
- B. Section 329119.13 Topsoil Placement and Grading: Placement of stored topsoil.

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.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Removal and storage of subsoil.
- B. Cutting, grading, filling and rough contouring the site prior to placement of topsoil or pavement base for final grading.
- 1.02 RELATED SECTIONS
 - A. Section 311100 Site Clearing.
 - B. Section 312316 Excavation Removal of Unsuitable Soils.
 - C. Section 312323.13 Backfilling Replacement of Unsuitable Soils.

1.03 REFERENCES

A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Sieve Analysis: Submit a sieve analysis of all types of fill material to be used.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Subsoil: Reused excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify that survey benchmark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, aboveground and aerial utilities. Stake and flag locations.
- C. Coordinate the removal or relocation of utilities with the necessary utility companies.
- D. Protect above and below-grade utilities that are to remain.

- E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.03 APPLICATION

- A. Excavate subsoil from areas to be further excavated or regraded. Do not excavate wet subsoil.
- B. Stockpile in area designated on site. Remove excess subsoil not being reused from site.
- C. Stockpile subsoil to a height not exceeding 8 feet. Cover to protect from erosion.
- D. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.
- E. Fill areas to contours and elevations with unfrozen subsoil material with allowances made for topsoil, aggregate base course or paving.
- F. Place and compact subsoil fill material in 12 inch lifts (compacted thickness). Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Make grade changes gradual. Blend slope into level areas.
- I. Remove surplus fill materials from site.

3.04 TOLERANCES

A. Maximum Variation From Top Surface of Subgrade: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- C. Perform compaction tests at a rate of one for every 10 cubic yards of material placed.

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 312213 Rough Grading.
- B. Section 312323.13 Backfill: 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.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes dewatering for building construction, tank construction and all other underground pipelines and utilities. All costs associated with work of this Section, including all costs associated with satisfying the requirements of the NYSDEC, shall be solely borne by the Contractor.
- B. No time extensions will be granted for the Contractor's failure to obtain the permit in accordance with the Contractor's own schedule and sequence of construction as may have been anticipated prior to the submission of the bid.

1.02 RELATED SECTIONS

- A. Section 312316 Excavation.
- B. Section 312323.13 Backfilling.
- C. Section 033000 Concrete.

1.03 PROJECT CONDITIONS

- A. Groundwater Levels: The Bidder shall be solely responsible to ascertain the exact level of groundwater prior to bid. Water levels, as shown on the Plans and listed in Appendix, solely represent the levels obtained at the times and specific locations of soil borings, monitoring wells, or test holes. They are not intended to be indicative of levels to be found at locations other than those shown. Separate payments will not be made to the Bidder / Contractor for the cost of ascertaining groundwater or surface water levels. Separate payments will not be made to the Contractor for dewatering operations. The Bidder shall contact the Engineer to request arrangements for access to the site to conduct explorations and investigations.
- B. Subsoil Conditions: The Contractor shall be solely responsible to ascertain the exact nature of soils near the excavation(s), as it affects the design of the dewatering conditions. The results of test borings previously conducted have been included in the Appendix and Drawings for information only. The cost for any additional test borings shall be borne by the Contractor.
- C. Noise Control: When dewatering systems utilizing well points or central pumping systems are used, acoustically shield pumping equipment from neighboring buildings. Use Styrofoam or other sound absorbing material on the inside of the enclosure surrounding the pump. Provide an exhaust stack extension when required by the Engineer. The Engineer will not permit the use of loud pumps generating excessive emissions and/or noise. Comply with the requirements of Section 015680 Environmental Protection.
- D. The Contractor shall supply power to all dewatering equipment by use of a suitably sized portable generator. Temporary electric shall be furnished and installed as work of this contract.
- E. Dewatering operations shall be conducted by companies regularly engaged in this type of work, are experienced, and are knowledgeable with governing health, labor, and environmental regulations associated with dewatering operations.

1.04 REGULATORY REQUIREMENTS

A. Apply, obtain, and pay for permits required by regulatory agencies. All associated costs including reports, plans, applications, and engineering fees shall be borne by the Contractor.

- B. The Contractor shall discharge water removed from trenches and excavations in compliance with the requirements of regulatory agencies and the Owner.
- C. The Owner makes no representation that water removed from excavations can be disposed of readily or without expense associated with conveyance and/or treatment prior to discharge. The Contractor, by submitting a bid, has satisfied himself/herself that disposal of water can be discharged (returned to groundwater or surface water) in accordance with all regulatory requirements.
- D. Well pointing shall be carried out by registered well drillers in accordance with Section 15-1525 of New York State Environmental Conservation Law.
- E. The type of dewatering system shall be selected by the Contractor, as necessary to install the work. The method of dewatering to be used will depend upon subsoil conditions and the depth of water encountered. The method of dewatering and treatment system, if necessary, is at the sole discretion of the Contractor.
- F. Conduct dewatering operations and groundwater recharge so as not to cause a harmful effect on adjoining wetlands in compliance with the requirements contained in Section 015680.

1.05 SUBMITTALS

- A. Prior to submitting information to the NYSDEC, the Contractor shall submit to the Engineer, for review and comment purposes only, the proposed layout of the dewatering system together with proposed sampling protocols that are to be followed by the Contractor in order to secure the required permits and approvals.
- B. Submit to the Engineer, for record purposes only, the proposed layout of the dewatering system together with any subsurface explorations, sampling and testing results, or studies that may have been conducted by the Contractor in order to secure the required permits and approvals.
- C. The Contractor shall provide a copy of the dewatering permit as issued by the New York State Department of Environmental Conservation to the Engineer for record purposes. Any permit costs shall be the responsibility of Contract G and shall be paid for out of the allowance.
- PART 2 MATERIALS

NOT USED

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Dewater trenches and excavations when ground or surface water is encountered in the installation of pipe, foundations, structures, or appurtenances.
- B. Furnish all piping, pumps, electrical systems and equipment, well pointing equipment, materials and labor required to properly well point or sump excavations in order to eliminate ground and surface water or precipitation from entering the excavation area during construction.

3.02 PERFORMANCE

A. All water removed from the trenches or excavations by pumping, bailing, siphoning, well-points, or other means shall be disposed of in such a manner so as to avoid interference with wetlands,

environment, plant operations, pedestrian and vehicular traffic and so to prevent damage to persons or property.

- B. Unless otherwise permitted, groundwater encountered within the limits of excavation shall be depressed to an elevation not less than twelve inches below the bottom thereof before pipe laying or concreting is started, and shall be so maintained until concrete and joint material have attained adequate and specified strength. Dewatering operations shall be continuous (24 hours per day, 7 days per week) unless otherwise noted on the Contract Drawings. Dewatering operations shall be continued until the entire structure is backfilled to the grades required by the Contract Documents.
- C. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or storm sewer without the approval of the NYSDEC.
- D. Water from dewatering operations shall be treated by chemical treatment, physical treatment, filtration, settling basins, or other NYSDEC approved methods to reduce the amount of contaminates, sediment, and/or pollution contained in the water to allowable levels, as determined by the State.
- E. Upon completion of the portion of the work wherein the operations have been performed, the Contractor shall remove from the catch basins, sumps, ditches or water courses, all mud, silt, debris and other accumulations discharged to these various locations. The Contractor is responsible for leaving them in a condition similar to that which existed prior to his operations to the satisfaction of the regulatory agency. Proper control measures shall be employed, to minimize siltation and erosion in and adjacent to the area of the Work at all times.
- F. Locate dewatering pumps as far as possible from residential structures. The pumps shall be housed in noise suppression enclosures. If the operation noise levels, as determined by the Engineer, are still excessive, the Contractor shall, at the discretion and direction of the Engineer, apply damping compound to the external portion of the enclosure.
- G. The Contractor is hereby advised that during the dewatering process, in some instances, as directed by the Engineer, the quantity of water to be discharged will have to be limited so that flooding will not occur.
- H. Dewatering shall continue as required to avoid floatation to structures until completed, unless other positive measures, such as flooding sleeves, can be used.

3.03 PROTECTION

- A. Provide adequate protection from the affect of possible uplift due to storm or groundwater where buoyancy might lift installed work or cause joint or structure failure during construction. Provide back-up equipment where pump failure could result in damage to installed work.
- B. Protect the interior of installed work from the entering and accumulation of liquids, ice, and snow. Immediately remove and dispose any accumulation that may occur.

3.04 CLEANING

A. Upon completion of all work, remove from the gutters, catch basins, drains, and manholes all debris and other accumulations, leaving them in a condition equal to or better than that, which existed prior to the work. Restore any pavement, shoulder or other areas disturbed or damaged by the installation of the dewatering system.

PART -1 GENERAL

1.01 SECTION INCLUDES

- A. Site structure backfilling to sub-grade elevations.
- B. Site filling and backfilling.
- C. Consolidation and compaction.
- D. Fill for over-excavation.
- E. Environmental testing.

1.02 RELATED SECTIONS

- A. Section 312316 Excavation.
- B. Section 312213 Rough Grading.

1.03 REFERENCES

- A. ANSI/ASTM D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-inch Drop.
- B. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Material Source: Submit name of imported material suppliers.
- 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 Unrestricted Soil Use Guidelines for each type of imported fill to be used.

1.05 PROJECT CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 017200.
- B. Provide documentation on the contractor's letterhead certifying that all fill material utilized for this project came from approved sources and met the requirements of the NYSDEC Unrestricted Program Soil Use Guidelines.

PART 2 - PRODUCTS

- 2.01 IMPORTED FILL SOURCE
 - A. 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.
 - B. 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 & PCB's/Pesticides | | |
| Soil Quantity | Discrete Samples | Composite | Discreet | |
| (cubic yards) | 4 | 4 | Samples/Composite | |
| 0-50 | 1 | 1 | 3-5 discrete samples from different locations in the fill being provided 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 | | |
| 800-1000 | 7 | 2 | | |
| >1000 | Add an additional 2 VOC and 1 composite for each additional 1000 cubic yards or consult with DER | | | |

C. Provide materials from the same source throughout the work. Change of source requires approval from the Engineer.

2.02 FILL MATERIALS

1.

A. Coarse Aggregate: Angular crushed or natural stone; washed, free of shale, clay, friable material, sand and debris; graded in accordance with ASTM D2487 Group Symbol GW or GP within the following limits

| Percent Passing | |
|-----------------|--|
| 100 | |
| 90 - 100 | |
| 0 - 15 | |
| 0 - 1 | |
| | |

- B. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM D2487 Group Symbol GC or GM, within the following limits:
 - 1. Minimum Size: ¹/₄ inch.
 - 2. Maximum Size: 5/8 inch.
- C. Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ASTM D2487 Group Symbol SW or SP, within the following limits:

| Sieve Size | Percent Passing |
|------------|--|
| a. No.4 | 100 |
| b. No. 14 | 0 - 100 |
| c. No. 50 | 5 - 90 |
| d. No. 100 | 4 - 30 |
| e. No. 200 | 0 |
| | a. No. 4 b. No. 14 c. No. 50 d. No. 100 |

- D. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants; no more than 15% passing the No. 200 sieve; no more than 30% retained on the ³/₄" sieve.
- E. Drywell Collar Material: Clean sand and gravel containing less than 15% fine sand, silt and clay. Silt and clay fractions are not to exceed 5%. Native material may be reused if it meets this requirement.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing 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. Compact subgrade to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with sand or subsoil and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy materials.
- C. Place and compact fill material in 12 inch lifts (compacted thickness). Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- D. Employ a placement method that does not disturb or damage structures or other items against which material is backfilled.
- E. Backfill against supported structures. Do not backfill against unsupported structures.
- F. Backfill simultaneously on each side of structure.
- G. Make grade changes gradual. Blend slope into level areas.
- H. Remove surplus backfill materials from site.
- I. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform field tests and analysis of fill material in accordance with ANSI/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 at the following rates:
 - 1. Pavement Subgrade: One test per 5,000 square feet of subgrade immediately prior to placing subbase.

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavate trenches for piping and utilities.
- B. Compacted bedding and backfill around and over piping and utilities to subgrade elevations.
- C. Backfilling and compaction.

1.02 RELATED SECTIONS

- A. Section 312213 Rough Grading: Topsoil removal from site surface.
- B. Section 312316 Excavation: Removal of unsuitable soils
- C. Section 312323.13 Backfilling Replacement of Unsuitable Soils.

1.03 REFERENCES

- A. ANSI/ASTM C136 Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Test Reports: Submit a sieve analysis for backfill to be used.

1.05 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Do not backfill over or with wet or frozen materials.
- C. Provide safety barricades around open excavations.

1.06 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the work are as shown on plans.

1.07 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate trenching with installation of pipe or conduit.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches 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 benchmarks, 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 in situ 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 below the proposed pipe invert.
- G. Correct unauthorized excavation at no cost to Owner in accordance with Section 312323.13.
- H. Stockpile excavated material in area designated on site and remove excess material not being used from site.

3.04 BACKFILLING

- A. Support pipe and conduit during placement and compaction of fill material.
- B. Place fill material to the dimensions and limits as shown on the plans.
- C. Place and compact fill material in 12 inch lifts (compacted thickness) for depths greater than 2 feet and 6 inch lifts (compacted thickness) for depths less than 2 feet. Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.

- D. Place fill material simultaneously on both sides of the pipe or conduit. Backfill to the dimensions and limits shown on the plans with reused subsoil.
- E. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- F. Place and compact material in continuous layers not exceeding 6 inches compacted depth.
- G. Employ a placement method that does not disturb or damage conduit or pipe.

3.05 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform field tests and analysis of fill material in accordance with ANSI/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 at the springline of the pipe and after each lift at 100 foot intervals along the pipe run.

3.07 CLEANING

- A. Remove surplus backfill materials from site.
- B. Leave fill material stockpile areas completely free of excess fill materials.

3.08 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Recompact fills subjected to vehicular traffic.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Crushed stone aggregate base course.

1.02 RELATED SECTIONS

A. Section 312213 - Rough Grading: Preparation of site for base course.

1.03 REFERENCES

- A. ANSI/ASTM C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- B. ANSI/ASTM C136 Sieve Analysis of Fine and Coarse Aggregates.
- C. ANSI/ASTM D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.
- D. ASTM D4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Test Reports: Submit a sieve analysis for the aggregate base course used.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Do not handle aggregate in any manner which will cause segregation of large or fine particles.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate: Angular, crushed, natural stone with crushed stone screenings; free of shale, clay, friable materials and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

| 1. | Sieve Size | % Passing |
|-----|--------------|-----------|
| 2. | 1-1/2 inches | 100 |
| 3. | 1 inch | 90-100 |
| 4. | 1/2 inch | 65-85 |
| 5. | 3/8 inch | 55-75 |
| 6. | No. 4 | 40-55 |
| 7. | No. 8 | 30-45 |
| 8. | No. 16 | 22-36 |
| 9. | No. 30 | 16-27 |
| 10. | No. 50 | 12-19 |
| 11. | No. 100 | 7-13 |
| 12. | No. 200 | 3-7 |
| | | |

B. Material retained on the 1/2 inch sieve is coarse aggregate.

- C. Coarse aggregate when subjected to 5 cycles of the soundness test in accordance with ANSI/ASTM C88 shall have a weight loss of not more than 5 percent with sodium sulfate or 10 percent with magnesium sulfate.
- D. The portion of the aggregate base course which passes the No. 50 screen shall have a plasticity index of zero as tested in accordance with ASTM D4318.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify elevations of subgrade are as indicated on the plans.
- C. Verify that subgrade is properly compacted and ready to receive work of this section.
- D. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

A. Fine grade and compact subgrade to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.

3.03 AGGREGATE PLACEMENT

- A. Spread course aggregate over prepared subgrade to a total compacted thickness as indicated on the plans.
- B. Place aggregate in 3 inch layers and compact by roller.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Compact placed aggregate materials to 95% maximum dry density in accordance with ANSI/ASTM D1557. Maintain optimum moisture content to attain required density.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.
- H. New pavement must be placed on the properly compacted aggregate base course within 24 hours of final compaction. If aggregate base course is left open for more than 24 hours, recompact and retest in accordance with ANSI/ASTM D1557.

3.04 TOLERANCES

- A. Maximum Variation From Flatness: 1/4 inch measured with 10 foot straight edge.
- B. Maximum Variation From Scheduled Compacted Thickness: 1/4 inch.
- C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Compaction testing will be performed in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Frequency of Tests: One test per 500 sq ft. immediately prior to paving.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asphaltic concrete paving; wearing, binder or base course.

1.02 RELATED SECTIONS

A. Section 321123.16 - Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

- A. AI MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
- B. AI MS-8 Asphalt Paving Manual.
- C. ASTM D242 Mineral Filler for Bituminous Paving Mixtures.
- D. ASTM D546 Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Supplier: Submit name of asphalt supplier to be used on the project prior to placement of any asphalt on the project.
- C. Design Data: Submit asphalt mix design for each asphalt type to be used.
- D. Testing Firm: Submit name of testing firm to be performing tests on asphalt pavement.

1.05 QUALITY ASSURANCE

- A. Obtain materials from the same supplier throughout the duration of the project.
- B. Do not alter from mix design requirements.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver asphalt in sealed, metal containers covered with suitable material to protect the asphalt from the elements.
- C. Lightly lubricate the inside surface of the container with a thin oil or soap solution before loading asphalt.
- D. All containers must be cleaned of all foreign materials prior to loading.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.
- B. Do not place asphalt when precipitation is occurring.

PART 2 - PRODUCTS

2.01 2.01 - MATERIALS

- A. Asphalt Cement: AC-20; homogeneous, and shall not foam when heated to 347 degrees F.
- B. Fine Aggregate: Material passing the 1/8 inch sieve; natural sand of hard, strong, durable particles which are free from coatings or injurious amounts of clay, loam or other deleterious substances.
- C. Coarse Aggregate: Material retained on the 1/8 inch sieve; crushed stone or gravel; clean, durable, sharp angled fragments of rock of uniform quality.
- D. Mineral Filler: ASTM D242, finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter; 100 percent shall pass the No. 30 sieve; a minimum of 85 percent shall pass the No. 80 sieve; and a minimum of 65 percent shall pass the No. 200 sieve as measured in accordance with ASTM D546.
- 2.02 2.02 EQUIPMENT
 - A. Rollers: Minimum weight of 10 tons; equipped with lubricating devices for the roller wheels.
 - B. Pavers: Equipped with a vibratory device.

2.03 2.03 - ACCESSORIES

- A. Tack Coat: Homogeneous, medium curing, liquid asphalt.
- B. Wheel Lubricant: Oil-water mixture containing maximum 10 percent lubricating oil.

2.04 2.04 - MIXES

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Base Course: NYSDOT Type 1; 4.0 to 6.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

| SIEVE SIZE | PERCENT PASSING |
|------------|--------------------|
| 2 INCHES | 100 |
| 1 ½ INCHES | 90-100 |
| 1 INCH | 78-95 |
| ½ INCH | 57-84 |
| ¼ INCH | 40-72 |
| 1/8 INCH | 26-57 |
| NO. 20 | 12-36 |
| NO. 40 | 8-25 |
| NO. 80 | 4-16 |
| NO. 200 | 2-8 |

A. Binder Course: NYSDOT Type 3; 4.5 to 6.5 percent of asphalt cement by weight in mixture in accordance with the following gradation:

| Sieve Size | Percent Passing |
|--------------|-----------------|
| | |
| 1-1/2 inches | 100 |
| 1 inch | 95-100 |
| 1/2 inch | 70-90 |
| 1/4 inch | 48-74 |
| 1/8 inch | 32-62 |
| No. 20 | 15-39 |
| No. 40 | 8-27 |
| No. 80 | 4-16 |
| No. 200 | 2-8 |

B. Wearing Course: NYSDOT Type 6; 5.8 to 7.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

| Sieve Size | Percent Passing |
|------------|-----------------|
| | |
| 1 inch | 100 |
| 1/2 inch | 95-100 |
| 1/4 inch | 65-85 |
| 1/8 inch | 36-65 |
| No. 20 | 15-39 |
| No. 40 | 8-27 |
| No. 80 | 4-16 |
| No. 200 | 3-6 |

2.05 SOURCE QUALITY CONTROL

- A. Obtain asphalt materials from same source throughout the project.
- B. Provide asphalt in accordance with the approved mix design for each type of asphalt.
- C. Test samples in accordance with AI MS-2.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that compacted subbase is dry and ready to receive work of this section.
- C. Verify gradients and elevations of base are correct.
- D. Verify that all castings are properly installed and are at the correct elevations.
- E. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Apply tack coat at uniform rate of 0.03 to 0.07 gal/sq. yd. to contact surfaces of castings, curbs, gutters and any asphalt or concrete material.
- B. Do not apply tack coat to wet or frozen surfaces.

C. Coat top surfaces of castings with oil to prevent bond with asphalt pavement.

3.03 INSTALLATION

- A. Install work in accordance with AI MS-8.
- B. Maintain asphalt temperature between 250 and 325 degrees F during placement.
- C. Place asphalt within 24 hours of applying tack coat.
- D. Place asphalt to compacted thicknesses as identified on plans. If a multiple course pavement is to be used, place top course within 24 hours of placing bottom course. If more than 24 hours elapse, a tack coat will be required to be placed over the entire surface of the bottom course prior to any additional paving.
- E. Utilize the vibratory device on the paver at all times.
- F. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- G. Compact pavement to a minimum of 94% maximum density.
- H. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- I. Seal all joints between new pavement and existing pavement with asphalt cement.

3.04 TOLERANCES

- A. Maximum Variation From Flatness: 1/8 inch measured with 10 foot straight edge.
- B. Maximum Variation From Scheduled Compacted Thickness: 1/8 inch.
- C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Take samples and perform tests in accordance with AI MS-2.
- C. Test are to include percent compaction, gradation and asphalt content.
- D. Provide an asphalt thermometer for determining the asphalt temperature during paving operations.
- E. Frequency of Tests: One test for every 1,000 square feet of each pavement course.

3.06 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect pavement from mechanical injury until project is accepted by the Owner.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete parking areas and roads.
- B. Formwork.
- 1.02 RELATED SECTIONS
 - A. Section 312213 Rough Grading.
 - B. Section 321123.16 Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

- A. ACI 301 Structural Concrete for Buildings.
- B. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement.
- C. ANSI/ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- D. ASTM A615 Deformed and Plain Billet-Steel for Concrete Reinforcement.
- E. ASTM C33 Concrete Aggregates.
- F. ASTM C94 Ready Mix Concrete.
- G. ASTM C150 Portland Cement
- H. ASTM C260 Air-Entraining Admixtures for Concrete.
- I. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete.
- J. ASTM C494 Chemical Admixtures for Concrete.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on joint filler, admixtures and curing compounds.
- C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.
- D. Design Data: Provide a design mix for each type of concrete used on the project.
- E. Certificates: Submit receipts of all concrete deliveries indicating source, date, contractor, amount of concrete, concrete strength, truck number and time load was batched.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record locations of each day's concrete pour.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain concrete only from approved suppliers and maintain same source throughout duration of the project.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver concrete in accordance with ASTM C94, Alternative No. 2.
- C. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150 Air Entraining Type IA Portland type, gray color.
- B. Aggregates: ASTM C33.
- C. Water: Potable, not detrimental to concrete.
- D. Reinforcing Bars: ASTM A615; 60 ksi yield grade; deformed billet steel bars; uncoated finish.
- E. Dowels: ASTM A615; 60 ksi yield grade, plain steel, uncoated finish.
- F. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.

2.02 ACCESSORIES

- A. Steel Forms: Minimum 16 gauge thick, stiffened to support weight of concrete with a minimum deflection.
- B. Plywood Forms: Douglas Fir species; solid one side grade; sound, undamaged sheets.
- C. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.
- D. Air Entrainment Admixture: ASTM C260.
- E. Chemical Admixture: ASTM C494, type as required.
- F. Curing Compound: ASTM C309, Type 2, Class A.
- G. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.
- H. Joint Sealant: ASTM C920, Type M, Grade P; SL-2 by Sonneborn or equal.

2.03 MIXES

- A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.
- B. The mix design shall be such that the concrete shall attain the following characteristics:
 - 1. Compressive Strength (28 days): 4,000 psi.
 - 2. Slump: 2-1/2 to 3-1/2 inches.
 - 3. Air Entrainment: 6%±1%.
- C. Use chemical admixtures only when approved by Engineer. Use of admixtures will not relax placement requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify compacted granular subbase has been properly placed and is ready to receive work of this section.
- C. Verify gradients and elevations of base are correct.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.
- C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.
- D. Place and secure forms to correct location, dimension, and profile.
- E. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.03 INSTALLATION

- A. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.
- B. Place dowels to achieve pavement and curb alignment as detailed on the plans.
- C. Place reinforcement as indicated on the plans. Interrupt reinforcement at expansion joints.
- D. Provide doweled joints with one end of dowel greased or set in capped sleeve to allow longitudinal movement.
- E. Place concrete in accordance with ACI 301.

- F. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- G. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Vibrate concrete adjacent to forms.
- I. Place concrete to pattern indicated on the plans.
- J. Place expansion and contraction joints as indicated on the plans.
- K. Place joint filler between paving components and building or other appurtenances.
- L. Provide keyed joints as indicated.
- M. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing at the locations shown on the plans. Cut 1/3 into depth of slab.
- N. Apply a light broom finish perpendicular to vehicular traffic.
- O. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of each class of concrete placed each day.
- C. Cure test cylinders on site under same conditions as concrete they represent.
- D. Take one slump test for each set of test cylinders taken. Concrete not meeting slump requirements will be rejected.
- E. Concrete represented by cylinders that do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect pavement from premature drying, excessive temperatures and mechanical injury.
- C. Protect pavement from damage until project is accepted by the Owner.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, handicap ramps, driveway aprons.
- B. Formwork.
- 1.02 RELATED SECTIONS
 - A. Section 312213 Rough Grading: Preparation of subgrade for sidewalk placement.
 - B. Section 321123.16 Recycled Concrete Aggregate Base Course

1.03 REFERENCES

- A. ACI 301 Structural Concrete for Buildings.
- B. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement.
- C. ANSI/ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- D. ASTM C33 Concrete Aggregates.
- E. ASTM C94 Ready Mix Concrete.
- F. ASTM C150 Portland Cement
- G. ASTM C260 Air-Entraining Admixtures for Concrete.
- H. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete.
- I. ASTM C494 Chemical Admixtures for Concrete.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on joint filler, admixtures and curing compounds.
- C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.
- D. Design Data: Provide a design mix for each type of concrete to be used on the project.
- E. Certificates: Submit receipts of all concrete deliveries, indicating source, date, contractor, amount of concrete, concrete strength, truck number and time load was batched.
- F. Testing Firm: Submit name of testing firm to be performing tests on concrete.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record locations of each day's concrete pour.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain concrete only from approved suppliers and maintain the same source throughout the project.
- 1.07 DELIVERY, STORAGE AND HANDLING
 - A. Deliver, store and handle products to the site under provisions of Section 016500.
 - B. Deliver concrete in accordance with ASTM C94, Alternative No. 2.
 - C. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150, air entraining, Type 1A Portland, gray color.
- B. Aggregates: ASTM C33.
- C. Water: Potable and not detrimental to concrete.
- D. Reinforcement: ANSI/ASTM A185 plain welded steel wire fabric; in flat sheets; epoxy finish.

2.02 ACCESSORIES

- A. Forms: Douglas Fir plywood type; solid, sound, undamaged sheets.
- B. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.
- C. Air Entraining Admixture: ASTM C260.
- D. Chemical Admixture: ASTM C494, type as required.
- E. Curing Compound: ASTM C309, Type 1, Class A.
- F. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.
- G. Detectable Warning Surface: SAFTI-TRAX Mats or equal.
- H. Joint Sealant: ASTM C920,,Type M, Grade P; SL-2 by Sonneborn or equal.

2.03 MIXES

- A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.
- B. The mix shall be such that the concrete shall attain the following characteristics:

- 1. Compressive Strength (28 days):
- 2. Slump:
- 3. Air Entrainment: $6\% \pm 1\%$.
- C. Use chemical admixtures only when approved by the Engineer. Use of admixtures will not relax placement requirements.

4,000 psi.

 $2\frac{1}{2}$ to $3\frac{1}{2}$ inches.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify datum and all elevations are as indicated on the plans.
- C. Verify compacted granular subbase has been properly prepared and is ready to receive work of this section.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Compact base to minimum 95 percent maximum dry density in accordance with ANSI/ASTM D1557.
- B. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.
- C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.
- D. Place and secure forms to correct location, dimension and profile.
- E. Assemble formwork to permit easy stripping and dismantling without damaging concrete. Coat forms with form release agent.

3.03 INSTALLATION

- A. Place joint filler vertical in position in straight lines. Secure to formwork during concrete placement.
- B. Place reinforcement as indicated on the plans. Interrupt reinforcement at expansion joints.
- C. Place concrete in accordance with ACI 301.
- D. Ensure reinforcement and formed joints are not disturbed during concrete placement.
- E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that joints occur.
- F. Vibrate concrete adjacent to forms.
- G. Place concrete to pattern indicated.
- H. Place expansion joints with joint filler at 20 foot intervals.
- I. Place scored contraction joints at 4 foot intervals.

321313.33 - 3

- J. Place joint filler between paving components and building or other appurtenances and in expansion joints.
- K. Apply a light broom finish perpendicular to traffic.
- L. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing shall be performed under provisions of Section 014500.
- B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of each class of concrete placed each day.
- C. Cure test cylinders on site under same conditions as concrete sidewalk.
- D. Take one slump test for each set of test cylinders taken.
- E. Concrete not meeting slump requirements will be rejected.
- F. Concrete represented by cylinders which do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect sidewalk from premature drying, excessive temperatures and mechanical injury.
- C. Protect sidewalk from damage until project is accepted by the Owner.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Reinforced concrete curb.
- B. Formwork.
- 1.02 RELATED SECTIONS
 - A. Section 312213 Rough Grading.

1.03 REFERENCES

- A. ACI 301 Structural Concrete for Buildings.
- B. ANSI/ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- C. ASTM A615 Deformed and Plain Billet Steel for Concrete Reinforcement.
- D. ASTM C33 Concrete Aggregates.
- E. ASTM C94 Ready Mix Concrete.
- F. ASTM C150 Portland Cement
- G. ASTM C260 Air-Entraining Admixtures for Concrete.
- H. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete.
- I. ASTM C494 Chemical Admixtures for Concrete.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on joint filler, admixtures and curing compounds.
- C. Supplier: Submit name of concrete supplier prior to the placement of any concrete on the project.
- D. Design Data: Provide a design mix for concrete to be used on the project.
- E. Certificates: Submit receipts of all concrete deliveries, indicating source, date, contractor, amount of concrete, concrete strength, truck number and time truck load was batched.
- F. Testing Firm: Submit name of testing firm to be performing tests on concrete.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record locations of each day's concrete pours.
- 1.06 QUALITY ASSURANCE
 - A. Perform work in accordance with ACI 301.

B. Obtain concrete only from approved suppliers and maintain the same source throughout the project.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver concrete in accordance with ASTM C94, Alternative No. 2.
- B. Place all concrete within 90 minutes of time load was batched.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees, or if surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150, Type 1 Portland, gray color.
- B. Aggregates: ASTM C33.
- C. Water: Potable and not detrimental to concrete.
- D. Reinforcement: ANSI A615 steel; 60 ksi yield grade; deformed billet steel bars; epoxy finish.
- E. Dowels: ASTM A615 steel; 60 ksi yield grade; plain steel, epoxy finish.

2.02 ACCESSORIES

- A. Steel Forms: Minimum 16 gauge thick, stiffened to support weight of concrete with a minimum deflection.
- B. Wood Forms: Douglas Fir species; solid, sound, undamaged sheets; minimum 2 inches (50 mm) thick.
- C. Joint Filler: ANSI/ASTM D1751; 1/2 inch thick.
- D. Air Entraining Admixture: ASTM C260.
- E. Chemical Admixture: ASTM C494, type as required.
- F. Curing Compound: ASTM C309, Type 1, Class A.
- G. Form Release Agent: Colorless material which will not stain concrete or absorb moisture.
- H. Joint Sealant: ASTM C920, Type S, Grade NS; NP-1 by Sonneborn or equal.

2.03 MIXES

- A. Concrete shall be mixed and prepared in accordance with the approved mix design and ASTM C94, Alternative No. 2.
- B. The mix shall be such that the concrete shall attain the following characteristics:
 - Compressive Strength (28 days): 4,000 psi.
 - $2\frac{1}{2}$ to $3\frac{1}{2}$ inches.

Slump:

1.

2.

H2M

- 3. Air Entrainment: $6\% \pm 1\%$.
- C. Use chemical admixtures only when approved by the Engineer. Use of admixtures will not relax placement requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify datum and all elevations are as indicated on the plans.
- C. Verify compacted granular subbase has been properly prepared and is ready to receive work of this section.
- D. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Excavate to the required depth and compact surface.
- B. Place and secure forms to correct location, dimension and profile.
- C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- D. Moisten base to a minimum depth of 1/2 inch to minimize absorption of water from fresh concrete.
- E. Coat forms with form release agent.

3.03 INSTALLATION

- A. Place joint filler vertical in position and at equal spaces not exceeding 20 feet. Secure to formwork during concrete placement.
- B. Place dowels through joint filler as indicated on the plans. One end of dowel is to be greased or set in a capped sleeve to allow longitudinal movement.
- C. Place reinforcement as indicated on the plans. Interrupt at expansion joints.
- D. Place concrete in accordance with ACI 301.
- E. Ensure reinforcement, dowels, joint filler or forms are not disturbed during concrete placement.
- F. Place concrete continuously between construction joints. Do not break or interrupt successive pours such that cold joints occur.
- G. Vibrate concrete adjacent to forms.
- H. After concrete sets, but prior to curing, remove front forms without damaging concrete and apply a light broom finish to the top and face of the curb.
- I. Place curing compound on exposed surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing shall be performed under provisions of Section 014500.
- B. Take six concrete test cylinders for every 50 cu. yds. or fraction thereof of concrete placed each day.
- C. Cure test cylinders on site under same conditions as curb.
- D. Take one slump test for each set of cylinders taken.
- E. Concrete not meeting slump requirements will be rejected.
- F. Concrete represented by cylinders which do not meet required strength will be removed and replaced at no additional cost to the Owner.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect curb from premature drying, excessive temperatures, rain and mechanical injury.
- C. Protect curb from damage until project is accepted by the Owner.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.
- 1.02 RELATED REQUIREMENTS
 - A. Section 321723 Pavement Markings.

1.03 REFERENCE STANDARDS

- A. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- B. ASTM C150/C150M Standard Specification for Portland Cement; 2022.
- C. ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- D. ASTM C330/C330M Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide unit configuration, dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, complying with the following:
 - 1. Cement: ASTM C150/C150M, Portland Type I Normal; white color.
 - 2. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
 - 3. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
 - 4. Air Entrainment Admixture: ASTM C260/C260M.
 - 5. Concrete Mix: Minimum 5,000 psi (34 MPa) compressive strength after 28 days, air entrained to 5 to 7 percent.
 - 6. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
 - 7. Embed reinforcing steel, and drill or sleeve for two dowels.
 - 8. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
 - 9. Minor patching in plant is acceptable, providing appearance of units is not impaired.
- B. Dowels: Steel, unfinished; 1/2 inch (12 mm) diameter, 18 inch (457 mm) long, pointed tip.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Concrete for sidewalks and platforms.
- B. Section 31131.33 Portland Cement Concrete Sidewalks: Concrete sidewalks.

1.03 REFERENCE STANDARDS

- A. 49 CFR 37 Transportation Services for Individuals with Disabilities (ADA); current edition.
- B. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- C. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.
- E. ATBCB PROWAG Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; 2011.

1.04 SUBMITTALS

- A. See Section 013300 Submittals, for submittal procedures.
- B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.
- C. Samples: For each product specified provide two samples, 8 inches (203 mm) square, minimum; show actual product, color, and patterns.
- D. Shop Drawings: Submit plan and detail drawings. Indicate:
 - 1. Locations on project site. Demonstrate compliance with referenced accessibility standards.
 - 2. Sizes and layout.
 - 3. Pattern spacing and orientation.
 - 4. Attachment and fastener details, if applicable
- E. Warranty: Submit manufacturer warranty; complete forms in Owner's name and register with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F (4 and 32 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic Tactile and Detectable Warning Surface Tiles:
 - 1. Access Tile, a brand of Access Products, Inc: www.accesstile.com/#sle.
 - 2. Substitutions: See Section 012500 Product Substitution Requirements.

2.02 TACTILE AND DETECTABLE WARNING DEVICES

- A. Plastic Tactile and Detectable Warning Tiles: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory-applied removable protective sheeting.
 - 1. Installation Method: Cast in place.
 - 2. Pattern: In-line pattern of truncated domes complying with ADA Standards.
 - 3. Edge: Square.
 - 4. Color: As selected by Architect/Engineer from manufacturer's standard range.

2.03 ACCESSORIES

- A. Fasteners: ASTM A666, Type 304 stainless steel
 - 1. Type: Countersunk, color matched composite sleeve anchors
 - 2. Size: 1/4 inch (6.35 mm) diameter and 1-1/2 inches (38 mm) long.
- B. Adhesive: Type recommended and approved by surfacing tile manufacturer.
- C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. When installation location is near site boundary or property line, verify required location using property survey.
- B. Verify that work area is ready to receive work:
 - 1. If existing conditions are not as required to properly complete the work of this section, notify Architect/Engineer.
 - 2. Do not proceed with installation until deficiencies in existing conditions have been corrected.
- C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's written instructions.
 - 1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.

- 2. Do not install when ambient or substrate temperature has been below 40 degrees F (4 degrees C) during the preceding 8 daylight hours.
- B. Field Adjustment:
 - 1. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
 - 2. Orient so dome pattern is aligned with the direction of ramp.
 - 3. Align truncated dome pattern between adjacent units.
- C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.03 INSTALLATION, CAST IN PLACE PLASTIC TILES

- A. Concrete:
 - 1. See Section 033000.
 - 2. Slump: 4 to 7 percent.
- B. When installing multiple adjacent units, leave a 3/16 inch (5 mm) gap between units to allow for expansion.
- C. Tamp and vibrate units as recommended by manufacturer.
- D. Place and position weights on units while concrete cures as recommended by manufacturer. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

3.04 CLEANING PLASTIC UNITS

- A. Remove protective plastic sheeting within 24 hours of installation.
- B. Remove excess sealant or adhesive from joints and edges.
- C. Clean four days prior to date of scheduled inspection.

3.05 PROTECTION

- A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.
- B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

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.

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Bollards.
- B. Footings and foundations.

1.02 REFERENCES

- A. ASTM A36 Structural Steel.
- B. ASTM C33 Concrete Aggregates.
- C. ASTM C150 Portland Cement.
- D. ASTM C260 Air-Entraining Admixtures for Concrete.
- E. ASTM C330 Lightweight Aggregates for Structural Concrete.

1.03 SUBMITTALS FOR REVIEW

A. Section 013300 - Submittals

PART 2 - PRODUCTS

2.01 MATERIALS

A. ASTM A36 structural steel tubing.

2.02 BOLLARDS

- A. Formed Steel Tubes: 1/4" thick, 6" diameter galvanized steel, concrete filled, painted yellow.
- B. PVC Bollard Cover: Manufactured by ULINE, Model H-9231Y. Color: As indicated on plans.
- C. Quantity: As indicated on plans.
- D. See Section 033000 CAST-IN-PLACE CONCRETE for concrete requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units in accordance with manufacturer's instructions, without damage. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Install bollards in footings. Bollards shall be installed in locations as per O&R requirements or in locations as directed by Engineer.

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) gravity retaining wall without geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mixture, exhibit a final handling weight in excess of 1,000 pounds (450 kg) per unit, and may utilize concrete reinforcing steel.
- B. Scope of Work: The work shall consist of furnishing materials, labor, equipment, and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design, and dimensions shown in the project site plans.
- C. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 31, Division 32 and Division 33 also apply to this Section.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Allowances. No allowance shall be made in the price of the retaining wall for excavation beyond the limits required for retaining wall construction as shown on the project plans. The cost of excavation for the purposes of site access shall be the responsibility of the General Contractor. Removal of unsuitable soils and replacement with select fill shall be as directed and approved in writing by the Owner or Owner's representative and shall be paid under separate pay items.
- B. Unit Prices. In addition to a lump sum price pursuant to completion of the scope of work described in Part 1.01 of this Section, the General Contractor shall provide a unit price per square foot of vertical wall face that shall be the basis of compensation for up to a ten (10) percent increase or reduction in the overall scope of the retaining wall work.
- C. Measurement and Payment.
 - 1. The unit of measurement for furnishing the precast modular block retaining wall system shall be the vertical area of the wall face surface as measured from the top of the leveling pad to the top of the wall including coping. The final measured quantity shall include supply of all material components and the installation of the precast modular block retaining wall system.
 - 2. The final accepted quantities of the precast modular block retaining wall system will be compensated per the vertical face area as described above. The quantities of the precast modular block retaining wall as shown on the plans and as approved by the Owner shall be the basis for determination of the final payment quantity. Payment shall be made per square foot of vertical wall face.

1.03 REFERENCES

- A. Where the specification and reference documents conflict, the Owner's designated representative will make the final determination of the applicable document.
- B. Definitions:
- C. Precast Modular Block (PMB) Unit machine placed, "wet cast" concrete modular block retaining wall facing unit.
 - 1. Geotextile a geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.

- 2. 3. Drainage Aggregate clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.
- 3. Unit Core Fill clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.
- 4. Foundation Zone soil zone immediately beneath the leveling pad.
- 5. Retained Zone soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures.
- 6. Leveling Pad hard, flat surface upon which the bottom course of precast modular blocks are placed. The leveling pad may be constructed with crushed stone or cast-in-place concrete. A leveling pad is not a structural footing.
- 7. Wall Infill the fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.
- D. Reference Standards
 - 1. Design
 - a. AASHTO LRFD Bridge Design Specifications, 8th and 9th Edition.
 - b. Minimum Design Loads for Buildings and Other Structures ASCE/SEI 7-16.
 - c. International Building Code, 2018 Edition.
 - d. Design Manual for Segmental Retaining Walls, National Concrete Masonry Association, 3rd Edition, 2010.
 - 2. Precast Modular Block Units
 - a. ACI 201 Guide to Durable Concrete
 - b. ACI 318 Building Code Requirements for Structural Concrete
 - c. ASTM C33 Standard Specification for Concrete Aggregates
 - d. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - e. ASTM C94 Standard Specification for Ready-Mixed Concrete.
 - f. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - g. ASTM C143 Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - h. ASTM C150 Standard Specification for Portland Cement
 - i. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - j. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete.
 - k. ASTM C494 Standard Specification for Chemical Admixtures for Concrete.
 - I. ASTM C595 Standard Specification for Blended Hydraulic Cements.
 - m. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - n. ASTM C666 Standard Test Method for Concrete Resistance to Rapid Freezing and Thawing.
 - o. ASTM C845 Standard Specification for Expansive Hydraulic Cement.
 - p. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
 - q. ASTM C989 Standard Specification for Slag Cement for Use in Concrete and Mortars.
 - r. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete.
 - s. ASTM C1157 Standard Performance Specification for Hydraulic Cement.
 - t. ASTM C1218 Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
 - u. ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures.
 - v. ASTM C1611 Standard Test Method for Slump Flow of Self-Consolidating Concrete.
 - w. ASTM C1776 Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.

- ASTM D6638 Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).
- y. ASTM D6916 Standard Test Method for Determining Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).
- 3. Geosynthetics
 - a. AASHTO M 288 Geotextile Specification for Highway Applications.
 - b. ASTM D3786 Standard Test Method for Bursting Strength of Textile Fabrics Diaphragm Bursting Strength Tester Method.
 - c. ASTM D4354 Standard Practice for Sampling of Geosynthetics for Testing.
 - d. ASTM D4355 Standard Test Method for Deterioration of Geotextiles
 - e. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - f. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - g. ASTM D4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - h. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - i. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - j. ASTM D4759 Standard Practice for Determining Specification Conformance of Geosynthetics.
 - k. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
 - I. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
 - m. ASTM D6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
- 4. Soils
 - a. AASHTO M 145 AASHTO Soil Classification System.
 - b. AASHTO T 104 Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
 - c. AASHTO T 267 Standard Method of Test for Determination of Organic Content in Soils by Loss of Ignition.
 - d. ASTM C33 Standard Specification for Concrete Aggregates.
 - e. ASTM D448 Standard Classification for Sizes of Aggregates for Road and Bridge Construction.
 - f. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft (2,700 kN-m/m)).
 - g. ASTM D1241 Standard Specification for Materials for Soil-Aggregate Subbase, Base and Surface Courses.
 - h. ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
 - i. ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft (2,700 kN-m/m)).
 - j. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - k. ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
 - I. ASTM D3080 Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions.
 - m. ASTM D4254 Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - n. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

- p. ASTM D4972 Standard Test Method for pH of Soils.
- q. ASTM D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
- r. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Aggregate by Nuclear Methods (Shallow Depth).
- s. ASTM G51 Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing.
- t. ASTM G57 Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method.
- 5. Drainage Pipe
 - a. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - ASTM F2648 Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. The General Contractor may choose to self-perform any or all of the work, and the Earthwork and Grading Contractor may or may not also be the RWIC. Also, the project Civil Engineer or the project Geotechnical Engineer may or may not also be the RWDE.
- B. Preconstruction Meeting. As directed by the Owner, the General Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the General Contractor, the Retaining Wall Design Engineer (RWDE), the Retaining Wall Installation Contractor (RWIC), the Earthwork/Grading Contractor, and the Qualified Inspection Engineer. The General Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.
 - 1. Preconstruction Meeting Agenda:
 - a. The RWDE shall be provided the opportunity to explain all aspects of the retaining wall construction drawings.
 - b. The RWDE shall communicate the required bearing capacity of the soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Inspection Engineer.
 - c. The RWDE shall explain the required shear strength of fill soil in the retained and foundation zones of the retaining wall to the Inspection Engineer.
 - d. The RWDE shall explain any measures required for coordination of the installation of utilities or other obstructions in the retained fill zones of the retaining wall.
 - e. The RWIC shall explain all excavation needs, site access and material staging area requirements to the General Contractor and Earthwork/Grading Contractor.

1.05 SUBMITTALS

- A. Product Data. At least 14 days prior to construction, the General Contractor shall submit the retaining wall product submittal package to the Owner's Representative for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following:
 - 1. Precast Modular Block System brochure
 - 2. Precast Modular Block concrete test results specified in Part 2.01, Paragraph B of this section as follows:
 - a. 28-day compressive strength
 - b. Air content
 - c. Slump or Slump Flow (as applicable)

- 3. Drainage Pipe
- 4. Geotextile
- B. Installer Qualification Data. At least 14 days prior to construction, the General Contractor shall submit the qualifications of the business entity responsible for installation of the retaining wall, the RWIC, per Part 1.07, Paragraph A of this section.
- C. Retaining Wall Design Calculations and Construction Shop Drawings. Prior to construction, the General Contractor shall furnish construction shop drawings and the supporting structural calculations report to the Owner for review and approval. Unless specifically requested by the Owner, the submittal may be in electronic format. This submittal shall include the following:
 - 1. Signed, sealed and dated drawings and engineering calculations prepared in accordance with these specifications.
 - 2. Qualifications Statement of Experience of the RWDE as specified in Part 1.07, subparagraph B of this section.
 - 3. Certificate of Insurance of the RWDE as specified in Part 1.06, Paragraph B of this section.

1.06 CONSTRUCTION SHOP DRAWING PREPARATION

- A. The RWDE shall coordinate the retaining wall construction shop drawing preparation with the project Civil Engineer, project Geotechnical Engineer and Owner's Representatives. The General Contractor shall furnish the RWDE the following project information required to prepare the construction shop drawings. This information shall include, but is not limited to, the following:
 - 1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans;
 - 2. electronic CAD file of the civil site plans listed in (1);
 - 3. report of geotechnical investigation and all addenda and supplemental reports;
 - 4. recommendations of the project Geotechnical Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.
 - 5. 5. Information pertaining to the magnitude, location, and nature of surcharge loadings acting on or near the proposed wall.
- B. The RWDE shall provide the Owner with a certificate of professional liability insurance verifying the minimum coverage limits of \$1 million per claim and \$1 million aggregate.
- C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local design or building code requirements exceed these specifications, the local requirements shall also be satisfied.
- D. The RWDE shall note any exceptions to the requirements of this section by listing them at the bottom right corner of the first page of the construction shop drawings.
- E. Approval or rejection of the exceptions taken by the Retaining Wall Engineer will be made in writing as directed by the Owner.
- F. The RWDE shall determine the appropriate standard(s) to be utilized, and to which the precast modular block design shall be based upon, except as noted herein. Refer to Part 1.03, Paragraph C, Part 1. Some project Owners may also specify which standard shall be used.
- G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in Paragraph F above, these

- H. Soil Shear Parameters. The RWDE shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the RWDE shall communicate the specific deficiency of the project information or data to the Owner in writing.
- I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.
- J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in the approved standards, as determined by the RWDE, as referenced in Section 1.06, Part F. The minimum recommended factors of safety shall be as follows, or as otherwise selected as appropriate by the RWDE:

| Normal Service (static) | 1.3 to 1.5* |
|--------------------------------|-------------|
| Seismic | 1.1 |
| Rapid Drawdown (if applicable) | 1.2 |

- K. *High uncertainty/variability, wall supporting critical or sensitive facilities: 1.5, low uncertainty/variability, wall not supporting critical or sensitive facilities: 1.3
- L. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology, or NCMA Allowable Stress Design (ASD) methodology as determined by the RWDE as referenced in Section 1.06, Part F.

1.07 QUALITY ASSURANCE

A. RWIC Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the RWIC shall document compliance with the following:

1. Experience.

- a. Construction experience with a minimum of 3,000 square feet (280 square meters) of the proposed precast modular block retaining wall system.
- b. Construction of at least three (3) precast modular block (large block) retaining wall structures within the past three (3) years.
- c. Construction of at least 5,000 square feet (465 square meters) of precast modular block (large block) retaining walls within the past five (5) years.
- 2. RWIC experience documentation for each qualifying project shall include:
 - a. Project name and location
 - b. Date (month and year) of construction completion
 - c. Contact information of Owner or General Contractor
 - d. Type (trade name) of precast modular block system used
 - e. Maximum height of the wall constructed
 - f. Face area of the wall constructed
- 3. In lieu of the requirements set forth in items 1 and 2 above, the RWIC must submit documentation demonstrating competency in precast modular block retaining wall construction through a training program that is deemed acceptable by the Owner.
- B. RWDE Qualifications and Statement of Experience. The RWDE shall submit a written statement affirming that he or she has the following minimum qualifications and experience.
 - 1. The RWDE shall be licensed to practice in the jurisdiction of the project location.

- 2. The RWDE shall be independently capable of performing all internal and external stability analyses, including those for seismic loading, compound stability, rapid draw-down and deep-seated, global modes of failure. The project geotechnical engineer may provide global stability analysis.
- 3. The RWDE shall affirm in writing that he or she has personally supervised the design of the retaining walls for the project, that the design considers all the requirements listed in paragraph 1.06 and that he or she accepts responsibility as the design engineer of record for the retaining walls constructed on the project.
- 4. The RWDE shall affirm in writing that he or she has designed a minimum of approximately 3,000 face square feet (280 face square meters) of modular block earth retaining walls within the previous five (5) years.
- 5. In lieu of these specific requirements, the engineer may submit alternate documentation demonstrating competency in Precast Modular Block retaining wall design.
- C. The Owner reserves the right to reject the design services of any engineer or engineering firm who, in the sole opinion of the Owner, does not possess the requisite experience or qualifications.

1.08 QUALITY CONTROL

- A. The Owner's Representative shall review all submittals for materials, design, RWDE qualifications and the RWIC qualifications.
- B. The Owner's Representative shall retain the services of an Inspection Engineer who is experienced with the construction of precast modular block retaining wall structures to perform inspection and testing. The cost of inspection shall be the responsibility of the Owner. Inspection shall be continuous throughout the construction of the retaining walls.
- C. The Inspection Engineer shall perform the following duties:
 - 1. Inspect the construction of the precast modular block structure for conformance with construction shop drawings and the requirements of this specification.
 - 2. Verify that soil or aggregate fill placed and compacted in the retained and foundation zones of the retaining wall conforms with paragraphs 2.04 and 2.05 of this section and exhibits the shear strength and bearing capacity parameters specified by the RWDE.
 - 3. Verify that the shear strength of the in-situ soil assumed by the RWDE is appropriate.
 - 4. Inspect and document soil compaction in accordance with these specifications:
 - a. Required dry unit weight
 - b. Actual dry unit weight
 - c. Allowable moisture content
 - d. Actual moisture content
 - e. Pass/fail assessment
 - f. Test location wall station number
 - g. Test elevation
 - h. Distance of test location behind the wall face
 - 5. Verify that all excavated slopes in the vicinity of the retaining wall are bench-cut as directed by the project Geotechnical Engineer.
 - 6. Notify the RWIC of any deficiencies in the retaining wall construction and provide the RWIC a reasonable opportunity to correct the deficiency.
 - 7. Notify the General Contractor, Owner and RWDE of any construction deficiencies that have not been corrected timely.
 - 8. Document all inspection results.
 - 9. Test compacted density and moisture content of the retained backfill with the following frequency:
 - a. At least once every 500 square feet (45 square meters) (in plan) per vertical lift, and
 - b. At least once per every 18 inches (460 mm) of vertical wall construction.

- D. The Owner's engagement of the Inspection Engineer does not relieve the RWIC of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.
- E. The RWIC shall inspect the on-site grades and excavations prior to construction and notify the RWDE and General Contractor if on-site conditions differ from the elevations, assumptions, grading, and soil and groundwater conditions depicted in the retaining wall construction shop drawings.

1.09 DELIVERY, STORAGE AND HANDLING

- A. The RWIC shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.
- B. The RWIC shall store and handle all materials in accordance with the manufacturer's recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.
- C. Geosynthetics
 - 1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials should be stored off the ground and protected from precipitation, sunlight, dirt and physical damage.
- D. Precast Modular Blocks
 - 1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.
- E. Drainage Aggregate and Backfill Stockpiles
 - 1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.
 - 2. Drainage aggregate material shall not be staged where it may become mixed with or contaminated by poor draining fine-grained soils such as clay or silt.

PART 2 - MATERIALS

2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

- A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.
- B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years, or the total time the manufacturer has been licensed, whichever is less.
- C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:

2.02 CONCRETE MIX PROPERTIES

| FREEZE THAW EXPOSURE CLASS ⁽¹⁾ | MINIMUM 28-DAY COMPRESSIVE STRENGTH ⁽²⁾ | MAXIMUM WATER CEMENT RATIO | NOMINAL MAXIMUM AGGREGATE SIZE | AGGREGATE CLASS DESIGNATION ⁽³⁾ | AIR CONTENT(4) |
|--|--|-------------------------------|---|--|----------------|
| MODERATE | 4,000 PSI (27.6 MPA) | 0.45 | 1 INCH (25 MM) | 3M | 4.5% +/- 1.5% |
| SEVERE | 4,000 PSI (27.6 MPA) | 0.45 | 1 INCH (25 MM) | 3S | 6.0% +/- 1.5% |
| VERY SEVERE | 4,500 PSI (30.0 MPA) | 0.40 | 1 INCH (25 MM) | 4S | 6.0% +/- 1.5% |
| MAXIMUM WATER-SOLUBLE CHLORIDE ION (CL-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT ^(5,6) | | | | | 0.15 |
| MAXIMUM CHLORIDE AS CL ⁻ CONCENTRATION IN MIXING WATER, PARTS PER MILLION | | | 1000 | | |
| MAXIMUM PERCENTAGE OF TOTAL CEMENTITIOUS MATERIALS BY WEIGHT ^(7,9) (VERY SEVERE EXPOSURE CLASS ONLY): | | | | | |
| FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618 | | | 25 | | |
| SLAG CONFORMING TO ASTM C989 | | | 50 | | |
| SILICA FUME CONFORMING TO ASTM C1240 | | | 10 | | |
| TOTAL OF FLY ASH OR OTHER POZZOLANS, SLAG, AND SILICA FUME ⁽⁸⁾ | | | 50 | | |
| TOTAL OF FLY ASH OR OTHER POZZOLANS AND SILICA FUME ⁽⁸⁾ | | | 35 | | |
| ALKALI-AGGREGA | TE REACTIVITY MIT | IGATION PER ACI | 201 | | |
| SLUMP (CONVENTIONAL CONCRETE) PER ASTM C143 ⁽¹⁰⁾ | | 0) 5 INCH | 5 INCHES +/- 11/2 INCHES (125 MM +/- 40 MM) | | |
| SLUMP FLOW (SELF-CONSOLIDATING CONCRETE) PER ASTM C1611 | | ASTM 18 INC | 18 INCHES – 32 INCHES (450 MM – 800 MM) | | |

- A. (1)Exposure class is as described in ACI 318. "Moderate" describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. "Severe" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. "Very Severe" describes concrete that is exposed to freezing and thawing cycles and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement.
- B. (2)Test method ASTM C39.
- C. (3)Defined in ASTM C33 Table 3 Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregates for Concrete.
- D. (4)Test method ASTM C231.
- E. (5)Test method ASTM C1218 at age between 28 and 42 days.
- F. (6)Where used in high sulfate environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)
- G. (7)The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:
- H. (a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.
- I. (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.

- J. (c) Silica fume, ASTM C1240, present in a blended cement.
- K. (8)Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.
- L. (9)Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.
- M. (10)Slump may be increased by a high-range water-reducing admixture.
- N. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown.

| | | Nominal | |
|---------------------------|-----------|---------------|--------------|
| Block Type | Dimension | Value | Tolerance |
| | Height | 18" (457 mm) | +/- 3/16" (5 |
| | | · · · | mm) |
| 28" (710 mm) Block | Length | 46-1/8" (1172 | +/- 1/2" (13 |
| 20 (710 mm) Block | | mm) | mm) |
| | Width* | 28" (710 mm) | +/- 1/2" (13 |
| | | | mm) |
| | Height | 18" (457 mm) | +/- 3/16" (5 |
| | | | mm) |
| 41" (1030 mm) Block | Length | 46-1/8" (1172 | +/- 1/2" (13 |
| | | mm) | mm) |
| | Width* | 40-1/2" (1030 | +/- 1/2" (13 |
| | | mm) | mm) |
| | Height | 18" (457 mm) | +/- 3/16" (5 |
| | | | mm) |
| 60" (1520 mm) Block | Length | 46-1/8" (1172 | +/- 1/2" (13 |
| 00 (1320 mm) Block | | mm) | mm) |
| | Width* | 60" (1520 mm) | +/- 1/2" (13 |
| | | | mm) |
| | Height | 36" (914 mm) | +/- 3/16" (5 |
| | | | mm) |
| 52" (1320 mm) XL | Length | 46-1/8" (1172 | +/- 1/2" (13 |
| Block | | mm) | mm) |
| | Width* | 52" (1320 mm) | +/- 1/2" (13 |
| | | | mm) |
| | Height | 36" (914 mm) | +/- 3/16" (5 |
| | | | mm) |
| 72" (1830 mm) XL | Length | 46-1/8" (1172 | +/- 1/2" (13 |
| Block | | mm) | mm) |
| | Width* | 72" (1830 mm) | +/- 1/2" (13 |
| | | | mm) |
| 96" (2440 mm) XL Block | Height | 36" (914 mm) | +/- 3/16" (5 |
| | | | mm) |
| | Length | 46-1/8" (1172 | +/- 1/2" (13 |
| | | mm) | mm) |
| | Width* | 96" (2440 mm) | +/- 1/2" (13 |
| | | | mm) |

* Block tolerance measurements shall exclude variable face texture

- O. Individual block units shall have a nominal height of 18 inches (457 mm), or 36 inches (914 mm) for XL blocks.
- P. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2), circular dome shear knobs that are 10 inches (254 mm), 7.5 inches (190 mm), or 6.75 inches (171 mm) in diameter and 4 inches (102 mm) or 2 inches (51 mm) in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above. The peak interface shear between any two (2) vertically stacked precast modular block units, with 10 inch (254 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m). as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5 inch (190 mm) or 6.75 inch (171 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m). Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.
- Q. In certain configurations and/or combinations of blocks, some minor on-site trimming/partial removal of some of the shear knobs may be necessary to allow for proper alignment.
- R. The 28" (710 mm) and 41" (1030 mm) precast modular block units may be cast with a 13" (330 mm) wide, continuous vertical core slot completely through the block, or solid concrete.
- S. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft 6 in (4.42 m).
- T. The precast modular block units shall be manufactured with integrally cast shear knobs that establish a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the four (4) standard horizontal set-back facing batter options listed below:

| Horizontal Set-Back/Blk. Course | Max. <u>Facing Batter</u> | Horizontal Set-Back/Blk. Course | Max. <u>Facing Batter</u> |
|------------------------------------|------------------------------|------------------------------------|------------------------------|
| 3/8" (10 mm) | 1.2° | 3-1/4" (83 mm) | 5.2° |
| 1-5/8" (41 mm) | 5.2° | | |
| 9-3/8" (238 mm) | 27.5° | | |
| 16-5/8" (422 mm) | 42.7° | | |

36-inch High Blocks:

- 1. The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.
- U. The precast modular block unit face texture shall be selected by the Owner from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.

18-inch High Blocks:

- V. The block color shall be selected by the Owner from the available range of colors available from the precast modular block manufacturer. Concrete blocks can also be stained after installation based upon Owner's selection of concrete stain colors.
- W. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5" (38 mm) in its largest dimension and cracks not wider than 0.012" (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75" (19 mm) in its largest dimension shall be permitted. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.
- X. Preapproved Manufacturers.
 - 1. Manufacturers of Redi-Rock Retaining Wall Systems as licensed by Redi-Rock International, LLC, 2940 Parkview Drive, Petoskey, MI 49770 USA; telephone (866) 222-8400; website: www.redi-rock.com.
- Y. Substitutions. Technical information demonstrating conformance with the requirements of this specification for an alternative precast modular block retaining wall system must be submitted for preapproval at least 14 calendar days prior to the bid date. Acceptable alternative PMB retaining wall systems, otherwise found to be in conformance with this specification, shall be approved in writing by the Owner 7 days prior to the bid date. The Owner's Representative reserves the right to provide no response to submissions made outside of the time requirements of this section or to submissions of block retaining wall systems that are determined to be unacceptable to the Owner.
- Z. Value Engineering Alternatives. The Owner may evaluate and accept systems that meet the requirements of this specification after the bid date that provide a minimum cost savings of 20% to the Owner. Construction expediency will not be considered as a contributing portion of the cost savings total.

2.03 GEOTEXTILE

- A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings. Additionally, the nonwoven geotextile fabric shall be placed in the v-shaped joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.
- B. Preapproved Nonwoven Geotextile Products
 - 1. Mirafi 140N
 - 2. Propex Geotex 451
 - 3. Skaps GT-142
 - 4. Thrace-Ling 140EX
 - 5. Carthage Mills FX-40HS
 - 6. Stratatex ST 142
- 2.04 DRAINAGE AGGREGATE AND WALL INFILL
 - A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the following particle-size distribution requirements per ASTM D6913:

- B. LEVELING PAD
- C. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the RWDE.
- D. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.04 or a preapproved alternate material.
- E. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

2.05 DRAINAGE

- A. Drainage Pipe
 - 1. Drainage collection pipe shall be a 4" (100 mm) diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.
 - 2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.
- B. Preapproved Drainage Pipe Products
 - 1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems.

PART 3 – EXECUTION

- 3.01 GENERAL
 - A. All work shall be performed in accordance with OSHA, State, and local safety standards, state and local building codes and manufacturer's requirements.
 - B. The General Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The General Contractor shall coordinate the work of subcontractors affected by this requirement.
 - C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.
 - D. The General Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.
 - E. All work shall be inspected by the Inspection Engineer as directed by the Owner.

3.02 EXAMINATION

A. Prior to construction, the General Contractor, Grading Contractor, RWIC and Inspection Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Fill Soil.
 - 1. The Inspection Engineer shall verify that retained backfill material placed within a horizontal distance of one (1.0) times the wall height behind the wall blocks satisfies the criteria of this section.
 - 2. The Inspection Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the RWDE as shown on the construction drawings.
- B. Excavation.
 - 1. The Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Grading Contractor.
 - 2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the RWDE and "Division 31, Section 31 20 00 Earthmoving" of these project specifications.
 - 3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.
- C. Foundation Preparation.
 - 1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Inspection Engineer shall ensure that the undercut limits are consistent with the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted in accordance with project specifications. The Inspection Engineer shall document the volume of undercut and replacement, if required.
 - 2. Following excavation for the leveling pad and undercut zone (if applicable), the Inspection Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.
 - a. The Inspection Engineer shall verify that the shear strength of the in-situ soil assumed by the RWDE is appropriate. The Inspection Engineer shall immediately stop work and notify the Owner if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.
 - b. The Inspection Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings per paragraph 1.06 I of this section.
- D. Leveling Pad.
 - 1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.

- 2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6" (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Inspection Engineer.
- 3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The RWIC shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

- A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, these specifications shall prevail.
- B. Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction shop drawings.
- C. Precast Modular Block Installation
 - 1. The first course of block units shall be placed with the front face edges tightly abutted together on adjacent blocks, on the prepared leveling pad at the locations and elevations shown on the construction drawings. The RWIC shall take special care to ensure that the bottom course of block units are in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.
 - Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks, and extend to a minimum distance of 12" (300 mm) behind the block unit.
 - 3. Drainage aggregate shall be placed in 9 inch to 12 inch maximum lifts (as specified by the Engineer) and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force, or by other suitable compaction methods.
 - 4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.
 - 5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard item 4 above, for the base course blocks in this application.
 - 6. Nonwoven geotextile fabric shall be placed between the drainage aggregate and the retained soil (gravity wall design) if required on the retaining wall construction drawings.
 - 7. Subsequent courses of block units shall be installed with a running bond (approximate half block horizontal course-to-course offset). With the exception of 90 degree corner units, the shear channel of the upper block shall be fully engaged with the shear knobs of the block course below. The upper block course shall be pushed forward to fully engage the interface shear key between the blocks and to ensure consistent face batter and wall alignment. Drainage aggregate, unit core fill, geotextile and properly compacted backfill shall be complete and in-place for each course of block units before the next course of blocks is stacked.
 - 8. The elevation of retained soil fill shall not be less than 1 block course (18" (457 mm)) below the elevation of the retained backfill throughout the construction of the retaining wall.

- 9. If included as part of the precast modular block wall design, cap units shall be secured with an appropriate construction adhesive in accordance with the Manufacturer's recommendation.
- D. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:
 - 1. Deviation from the design batter and horizontal alignment, when measured along a 10' (3 m) straight wall section, shall not exceed 3/4" (19 mm).
 - 2. Deviation from the overall design batter shall not exceed 1/2" (13 mm) per 10' (3 m) of wall height.
 - 3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2" (13 mm).
 - 4. The base of the precast modular block wall excavation shall be within 2" (50 mm) of the staked elevations, unless otherwise approved by the Inspection Engineer.
 - 5. Differential vertical settlement of the face shall not exceed 1' (300 mm) along any 200' (61 m) of wall length.
 - 6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2" (13 mm).
 - 7. The wall face shall be placed within 2" (50 mm) of the horizontal location staked.

3.05 WALL INFILL AND BACKFILL PLACEMENT

- A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:
 - 1. 98% of maximum dry density at ± 2% optimum moisture content per ASTM D698 standard proctor or 85% relative density per ASTM D4254.
- B. Compactive effort within 3' (0.9 m) of the back of the precast modular blocks should be accomplished with walk-behind compactors. Compaction in this zone shall be within 95% of maximum dry density as measured in accordance with ASTM D1557 modified proctor or 80% relative density per ASTM D 4254. Heavy equipment should not be operated within 3' (0.9 m) of the back of the precast modular blocks.
- C. Backfill material shall be installed in lifts that do not exceed a thickness of 9 to 12 inches (230 to 330 mm), as specified by Engineer.
- D. At the end of each work day, the RWIC shall grade the surface of the last lift of the granular wall infill to a $3\% \pm 1\%$ slope away from the precast modular block wall face and compact it.
- E. The General Contractor shall direct the Grading Contractor to protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL ZONE

- A. The RWIC shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.
- B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the RWDE can appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION

- A. For walls supporting unpaved areas, a minimum of 12" (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.
- B. For retaining walls with crest slopes of 5H:1V or steeper, appropriate soil erosion/sedimentation control measures shall be installed along the wall crest immediately following construction and grading of the crest slope. The crest slope above the wall shall be immediately seeded and protected to establish vegetation. The General Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.
- C. The General Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this section. The General Contractor shall notify the Owner of any deviations.

1.01 SECTION INCLUDES

- A. Finish grade subsoil.
- B. Place, level and compact topsoil.

1.02 RELATED SECTIONS

- A. Section 329219.16 Hydroseeding.
- B. Section 329300 Planting.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver topsoil to the site in uncontaminated containers.
- C. Do not stockpile topsoil over a height of 8 feet.
- D. Cover stockpiled topsoil to protect from precipitation, erosion and contamination.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not place wet or frozen topsoil.
- B. Do not place topsoil on wet or frozen ground or when precipitation is occurring.

1.05 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate with all adjacent work and work within areas to receive topsoil.
- C. Coordinate the storage of topsoil under provisions of Section 311100 with the placement of topsoil in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. 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 conditions.
 - B. Verify site conditions and note irregularities affecting work of this section.

C. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

- A. Prepare subsoil in accordance with Section 312213.
- 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 3 inches where topsoil is scheduled to be placed. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.03 INSTALLATION

- A. Place topsoil in areas where seeding, sodding or planting is scheduled or where shown on the plans.
- B. Place topsoil to the depths as indicated on the plans.
- C. Use topsoil in relatively dry state. Place during dry weather.
- D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles and contours of subgrade.
- E. Remove and dispose stone, roots, grass, weeds, debris and foreign material while spreading.
- F. Manually spread topsoil around trees, plants and building to prevent damage.
- G. Lightly roll placed topsoil.
- H. Remove surplus subsoil and topsoil from site. Do not remove surplus topsoil from the site prior to obtaining approval of the Engineer.
- I. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 TOLERANCES

A. Maximum Variation from Proposed Elevation: 1/2 inch.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 016500.
- B. Protect landscaping and other features remaining as final work.
- C. Protect existing structures, fences, roads, sidewalks, paving and curbs. Any damage caused by the Contractor to any of these items shall be repaired promptly by the Contractor at no additional cost to the Owner.

1.01 SECTION INCLUDES

- A. Seeding.
- B. Mulch, fertilizer, hydromulch and other accessories.
- C. Maintenance.

1.02 RELATED SECTIONS

- A. Section 329119.13 Topsoil Placement and Grading.
- B. Section 329300 Planting.

1.03 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.04 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.

1.05 SUBMITTALS

- A. Submit under provisions of Section 013000.
- B. Product Data: Provide data on seed mixtures, fertilizer and lime.
- C. Certificates: Provide certificates indicating that all fertilizer, pesticides and herbicides comply with all applicable regulatory agency requirements.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 017000.
- B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.07 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.

1.08 REGULATORY REQUIREMENTS

- A. Comply with applicable regulatory agencies for fertilizer, pesticide and herbicide composition.
- B. All fertilizer, pesticides and herbicides to be used shall comply with all applicable regulatory agency requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016000.
- B. Deliver grass seed mixture in original sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.
- D. Deliver Hydromulch in UV and weather resistant bags, showing weight, chemical analysis and name of manufacturer.

1.10 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. Planting Season: April 1st through May 15th or September 1st through October 15th.

1.11 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate with grading and placement of topsoil.
- C. Coordinate with installation of underground sprinkler system piping and watering heads.

1.12 WARRANTY

- A. Provide a one-year warranty under provisions of Section 017000.
- B. Include coverage for one continuous growing season; reseed areas of dead or unhealthy grass at no additional cost to the Owner.

1.13 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition, as determined by at least two cuttings, or until the job is accepted by the Owner, whichever occurs last.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Seed Mixes: by Ernst Seed or approved equal:
 - 1. Retention Basin Wildlife Mix:
 - a. Item: ERNMX-127, Seed Rate per Acre: 20 lbs per acre, or 0.5-1 lb/1,000 sq ft with a cover crop.
 - 2. Quick Erosion Control Cover Mix:
 - a. Item: ERNMX-104, Seed Rate per Acre: 50 lb per acre
 - Conservation Mix:
 a. Item: ERNMX-114, Seed Rate per Acre: 100-200 lb per acre, or 3-5 lb per 1,000 sq ft

1. Sun and Shade Mix:

a. Dry, fresh, re-cleaned seed of the latest crops and of the following proportions:

| Grass Type | % of Mixture | Minimum % Germination |
|---------------------|--------------|-----------------------|
| Kentucky Bluegrass | 15% | 85 |
| Creeping Red Fescue | 35% | 85 |
| Perennial Rygrass | 35% | 85 |
| Annual Rygrass | 15% | 85 |

2.02 ACCESSORIES

- A. Mulching Material: Hemlock species wood cellulose fiber, dust form, free of growth or germination inhibiting ingredients.
- B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions: Nitrogen 10 percent, phosphoric acid 6 percent, soluble potash 4 percent.
- C. Limestone: Ground dolomitic limestone containing a minimum of 90 percent calcium and magnesium carbonates. One hundred percent (100%) shall pass a No. 10 mesh screen and a minimum of 70 percent shall pass a No. 100 mesh screen.
- D. Hydromulch: 84 percent Mechanically processed straw, 15 percent Mechanically processed reclaimed cotton plant material and 1 percent of tackifier, activators and additives; minimum of 90 percent organic material; moisture content of 12 percent, total carbon to nitrogen ratio, 40:1. Color to be natural green.
- E. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 90 percent organic material measured by oven dry weight; pH range of 4 to 5 percent; moisture content of 30 percent; with moisture absorbtive capacity of 450 to 500 percent.
- F. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- G. Stakes: Softwood lumber, chisel pointed.
- H. String: Inorganic fiber.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing substrate and site conditions.
- B. Verify that prepared soil base is ready to receive the work of this section.
- C. Beginning of installation means installer accepts existing conditions.

A. Area to be seeded shall be cultivated with a scarifier to a depth of 4 inches. All stones, sticks and debris one inch and larger shall be removed. Area shall be smoothly graded to proper elevations.

3.03 APPLICATION

- A. Fill tank of mechanically agitated hydroseeding machine with sufficient water to suspend seed and fertilizers.
- B. Add water slowly while adding hydromulch. See manufacturer's recommendations to determine the proper application rate.
- C. Agitate for a minimum of ten minutes after adding the last amount of water and hydromulch.
- D. Apply hydromulch with a hydraulic seeder at a rate of 46 lbs per 1000 sq ft. Apply in a uniform layer from 2 opposing directions to ensure complete soil coverage.
- E. Do not hydroseed areas in excess of that which can be mulched on same day.
- F. 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.
- G. Clean all surfaces which have received hydroseeding overspray.
- H. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 8 feet on center.

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 finished work under provisions of Section 015000.
- B. Protect seeded areas with warning signs during maintenance period.

1.01 SECTION INCLUDES

- A. Furnishing plant material
- B. Excavation of planting pits
- C. Backfilling

1.02 RELATED SECTIONS

A. Section 329119.13 – Topsoil Placement and Grading.

1.03 REFERENCES

- A. Plant Nomenclature: Conform to the latest edition of "Standardized Plant Names" as adopted by the American Joint Committee of Horticultural Nomenclature (AJCHN).
- B. Size and Grading Standards: Conform to the current edition of "American Standard for Nursery Stock" (ASNS) Sponsor the American Association of Nurserymen Inc. (AANI), unless otherwise specified.

1.04 SUBMITTALS

- A. List of Plants: Before plant material is shipped to the project site, submit a complete itemized list of all plants including the source of supply.
- B. Product Data: Furnish the following with each planting material delivery.
 - 1. Invoice indicating sizes and variety of plant material.
 - 2. Certificates of inspection required by State and Federal agencies.
 - 3. Labels for each plant or bundles of plants indicating name and size.
- C. Quality Control Submittals:
 - 1. Worker's Qualifications Data: Names and addresses of 5 similar projects that each person has worked on during the past 2 years.

1.05 QUALITY ASSURANCE

- A. Worker's Qualifications: The persons performing the planting and their supervisor shall be personally experienced in the planting and caring of plant material and shall have been regularly employed by a company engaged in the planting and caring of plant material for a minimum of 2 years.
- B. Caliper trees up to 4 inches in caliber at a point 6 inches above ground and trees over 4 inches in caliber 12 inches above ground.
- C. Do not use woody plant material from regions south of latitude 39 degrees unless such material has been lined out in nurseries located north of latitude 39 degrees for at least 2 growing seasons. Latitude 39 degrees is approximately a line from Annapolis, MD to Cincinnati, OH.

1.06 DELIVERY, STORAGE AND HANDLING

A. Notify the Owner's Representative 48 hours in advance of delivery of plant material.

- B. Inspection certificates required by law shall accompany each shipment invoice to certify that all plants are free from disease and infestation and shall be filed with the Village Representative.
- C. Protect plants against climatic and mechanical injuries. All plants shall be packed, transported, and handled with care to ensure protection against injury. Spray deciduous plants in foliage with an approved "Anti-Desiccant" immediately after digging to prevent dehydration.
- D. Deliver fertilizer in manufacturer's standard sized bags showing weight, analysis, and manufacturer's name. Store under a waterproof cover or in a dry place.

1.07 PROJECT CONDITIONS

A. Water will be furnished by the Owner from existing facilities as directed. Furnish hoses and connections required to adequately water plants.

1.08 SCHEDULING

- A. Plant deciduous, woody plants between September 15 and May 15 whenever temperature is above 40 degrees F and soil is in workable condition, unless otherwise approved in writing.
- B. Plant evergreens between August 15 and September 15 or during April or May before the start of new growth.
- C. If project requires planting to occur at other times or deciduous plants are in-leaf, plants shall be sprayed with anti-desiccant prior to planting operations.

1.09 PLANTING GUARANTEE

A. The guarantee shall extend for a period of one year from the date of physical completion. Physical completion for the Work of this Section is the date or dates when all the planting operations, or seasonal portions of the planting operations, or replacement planting operations have been completed and are accepted by the Owner's Representative.

1.10 OWNER'S INSTRUCTIONS

- A. Contractor shall furnish all labor, equipment and materials necessary to complete the planting, maintaining and guaranteeing of all plant material as listed in the plant list within the Contract Drawings and as specified herein.
- B. The trees and shrubs included in the plant list are the anticipated scope of work. The Owner reserves the right to add or to delete from this list and to revise the species shown as necessary.

1.11 MAINTENANCE SERVICE

- A. Maintain plant life immediately after placement until plants are well established and exhibit a vigorous growing condition. Continue maintenance until termination of warranty period.
- B. Maintenance to include:
 - 1. Cultivation and weeding plant beds and tree pits.
 - 2. Applying herbicides for weed control in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
 - 3. Remedy damage from use of insecticides.
 - 4. Irrigating sufficiently to saturate root system.

- 5. Pruning, including removal off dead or broken branches, and treatment of pruned areas or other wounds.
- 6. Disease control.
- 7. Maintaining wrapping, guys, turnbuckles and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

PART 2 - PRODUCTS

2.01 PLANTS

- A. Trees and Shrubs:
 - 1. All plant materials used shall be true to botanical name, size and shall be legibly tagged in conformity with AJCHN and ASNS standards:
 - 2. Varieties: Names of varieties not listed conform generally with names accepted by the nursery trade.
 - 3. Nursery grown stock.
 - 4. Acclimated plants true to genus and species.
 - 5. Well developed root and branch systems. Do not prune branches before delivery.
 - 6. Free of disease, insect eggs, bark abrasions, and disfiguring knots.
 - 7. Buds intact and reasonably closed at time of planting.
 - 8. Balled and burlapped from soil which will hold a natural solid ball of earth of minimum specified size held in place securely by burlap and stout rope. Broken, loose, or manufactured balls will be rejected.
 - 9. Conform to size indicated or larger, or within the minimum maximum size when so indicated. Larger plants cut back to specified dimensions will not be accepted.
 - 10. Substitutions: No substitutions shall be accepted, except with the written approval from the Owner's Representative.
- B. Trees:
 - 1. Single erect leader from ground to top, surrounded with uniformly arranged branches unless otherwise specified in the plant list.
 - 2. Free from frost cracks, broken bark, and dead or broken branches.
 - 3. Transplanted, or root pruned 360 degrees at least once during the previous 3 years.

2.02 PLANTING SOIL

- A. Topsoil for Planting Soil: Refer to Section 329119.13.
- B. Soil Amendments (For every 4 cu yd of topsoil):
 - 1. Peat Moss: 7-1/2 cu ft bale or 15 bushels (loose measure).
 - 2. Fertilizer: 5 lb.
 - 3. Bonemeal: 80 lb.
- C. In the presence of the Owner's Representative, place the soil amendments over the topsoil piles and turn over the combined elements a minimum of 3 times until thoroughly mixed.

2.03 FERTILIZER

- A. Bonemeal: Commercial, steamed finely ground material containing not less than 1.0 percent nitrogen and 11 percent phosphoric acid.
- B. Commercial Fertilizer (10-6-4): Shall be a slow release soluble type containing not less than 10 percent nitrogen, 6 percent available phosphoric acid and 4 percent water soluble potash.

2.04 MULCH

- A. Peat Moss: Shall be imported Canadian sphagnum peat moss, brown, finely granulated material, passing a 1/2 inch sieve, free of weed, seed, sticks, woody roots, stones and mineral matter harmful to plant life and of such physical condition that it can be readily incorporated with the topsoil. Furnish material conforming to the following criteria:
 - 1. pH value: 3.0 to 5.0.
 - 2. Moisture: Not less than 25 percent nor more than 50 percent.
 - 3. Organic Material: Not less than 47 percent (90 percent dry basis).
- B. Mulch: Shredded Wood fiber produced from either hardwood or softwood trees, free of tannic acid, leaves, young green growth, wood shavings, sawdust or other objectionable foreign material.

2.05 MISCELLANEOUS MATERIALS

- A. Stakes, Deadmen and Guy Stakes: Sound, durable White or Red Cedar, or other approved wood, free of insect or fungus infestation.
- B. Guy Wire or Cable: No. 12 galvanized iron wire or cable.
- C. Tree Wrapping: 4 inch wide strips of jute burlap or waterproof paper 30-30-30 Krinklecraft by Eaton Brothers Corp., P.O. Box 60, Hamburg, NY 14075, (800) 433-3244.
- D. Protective Hose: 2-ply garden hose cut to required lengths to protect tree trunk's from damage by wires.
- E. Tree Wound Paint: Antiseptic, waterproof, adhesive, elastic tree wound paint containing no kerosene, coal tar, creosote, or other material harmful to cambium or living tissue.
- F. Anti-desiccants: Wilt-Pruf by Wilt-Pruf Products, Inc., P.O. Box 469, Essex, CT 06426, (203) 767-7033.
- G. Landscape Fabric: Typar Pro 3301, by Reemay, Inc., P.O. Box 511, Old Hickory, TN 37138-3651, (800) 284-2780.
- H. Planting Bed Edging: Edging to be Permaloc CleanLine Aluminum Edging. Size to be 1/8" x 4" (3.2mm x 102mm) x 8' or 16' lengths (2.5m or 4.9m). Finish shall be "Black Dura Flex" (Electrostatically applied baked on acrylic paint). As manufactured by Permaloc Corporation, Holland, MI 1-800-356-9660. Requires 3 stakes evenly spaced for each 8 feet (2.44 meters) section or 5 stakes evenly spaced for each 16 feet (4.88 meters) section with a total of 8 stake loops available in each 16 feet (4.88 meters) section necessary. Sections to include a 4" (102cm) stakless snapdown connection system to interlock adjacent sections. Edging to be 6063-T6 alloy. Edging shall be installed as per manufacturer's specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not install any plant material until after inspection and approval in writing of plant shipments. Secure written approval of any substitutions before planting. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost.

3.02 PREPARATION

- A. Planting Layout:
 - 1. Planting shall be located where it is shown on the plan except where obstructions overhead or below ground are encountered or where changes have been made in construction.
 - 2. Prior to the excavation of planting areas or plant pits, the Contractor shall ascertain the location of all utility lines so that proper precautions are made not to disturb or damage existing utilities. Should obstructions be found, the contractor shall promptly notify the Owner's Representative, who will arrange to relocate the plant material.
 - 3. Stake out tree locations and planting areas and obtain layout approval from the Owner's Representative prior to excavations of plant pits and beds.
- B. Plant Pit Dimensions: Minimum width 12 inches, measured at the ground surface.1. Balled and Burlapped Plants:
- C. Pit Depth: Not to exceed the ball depth.
- D. Pit Width: Measured at the ground surface, 3 times the width of the ball or as indicated.
 - 1. Container Grown Plants: 2 times the diameter of the container measured at the ground surface.
 - 2. Ground Cover Beds: Excavate entire bed to a depth of 4 inches.
- E. Excavation: Excavate pits to the dimensions specified. Dispose of unsuitable excavated material off the site and dispose of legally, unless otherwise directed.

3.03 PLANTING

- A. Setting Plants:
 - 1. All planting shall be done in the presence of the Owner's Representative.
 - 2. Backfill pits with planting soil and firm to the level upon which plants were previously growing. Set plants plumb and faced to give the best appearance or relationship to each other.
 - 3. Balled Plants: Set plants in position in center of the planting pit and backfill 1/3 depth of ball. Remove all ropes, wire, etc. from top and sides of ball and remove from hole before backfilling. Burlap shall be properly cut and removed from top and sides of ball to eliminate air pockets.
 - 4. Use topsoil as specified in these specifications for planting pits and beds. The Contractor shall test topsoil to supplement the topsoil with fertilizer and soil supplements as recommended by the soil test for the specified plantings. The soil test shall be by the local Agricultural Extension Service office and shall be at the Contractor's expense. Use planting mixture of 3 parts topsoil and 1 part approved commercial horticultural peat moss for backfill.
 - 5. Planting pits and beds shall be backfilled in nine (9") inch layers carefully to fill all voids and to avoid breaking roots. Tamp each layer of backfill firm to prevent settlement. Water thoroughly and add backfill to bring to appropriate level.
 - 6. The Contractor shall cultivate and rake over finished planting areas and shall leave them in an orderly condition. Planted areas shall receive a shallow basin, a slight earth saucer with a minimum three (3") inch lip, formed around planting pits and beds to hold water, size as shown on the plans or as directed. Break saucers and basins before ground freezes.
 - 7. Area in shrub beds between shrubs must be spaded and pulverized to a depth of six (6") inches. Arrangement of shrubs must meet with the approval of the Village representative. Shrubs shall not be planted closer than three (3') feet from the edge of shrub beds unless otherwise directed.

- B. Guying/Staking: Deciduous and evergreen trees, shall immediately after setting to proper grade, be guyed with stakes and no. 12 gauge malleable galvanized wire. Wires shall not come in contact with the tree, but shall be covered with rubber hose at points of contact. Set tree stakes into solid ground below bottom of plant before backfilling. Place stakes at the outer edge of the roots or ball in line with the prevailing wind at a 10 degree angle from the tree trunk. Stakes shall not be driven where utility lines are within five feet of finished grade, but shall be placed by digging holes for them. All stakes shall be placed outside the perimeter of planting pits. Safety flags shall be hung on all wires. Plants shall stand plumb after staking and all stakes and wires are to be maintained.
- C. Wrapping: Wrap the trunks of deciduous trees within 4 days after planting from the ground line to the height of the second branches. Wrap in a single layer wound spirally starting from base and overlapping 1-1/2 inches. Wrapping shall be securely tied at the top and bottom of the trunk with sisal yarn.
- D. Anti-Desiccant: Apply anti-desiccant spray to
- E. Spray deciduous plants in foliage with an approved "Anti-Desiccant" immediately after digging to prevent dehydration.
- F. Landscape Fabric: Install over the planting area to control weeds. Cut fabric as required to avoid shrubs.
- G. Mulching:
 - 1. After planting has been approved by the Owner, the Contractor shall place a layer of shredded wood fiber mulch, two to three inches thick around plants. The boundaries of this mulch shall be six inches greater in diameter than the planting pit. All shrub beds shall be completely covered with mulch.
 - 2. Water plants thoroughly after mulching.
- H. Pruning: Prune immediately after planting using sharp tools. Remove approximately 1/3 of the wood of deciduous plants, maintaining the natural habit of the plant. Broken or badly bruised branches shall be removed with a clean cut. Cut no leaders. No plants shall be pruned prior to delivery. Paint pruning cuts 3 inches in diameter or over with tree wound paint.
- I. Fertilizing: Fertilizer shall be a slow release soluble type. Fertilizer shall be equally distributed around each plant as per recommendation of fertilizer manufacturer for each type of plants.
- J. Establishment of Planting: Maintain plantings immediately following planting operations and continue throughout the guarantee period. Establishment of plantings shall consist of keeping plants in healthy, growing conditions by watering, weeding, cultivating, pruning, spraying, tightening of guys, re-mulching and by any other necessary operations of establishment. Water all plants at least once a week between April 1 and October 31 with approximately 5 gallons per square yard (1 inch layer of water) per watering unless otherwise directed. Provide additional watering during periods of dry weather when required or when directed. Treat plants with good horticultural preventative or remedial measures to control insects, diseases or rodents.

3.04 FIELD QUALITY CONTROL

- A. Inspections and replacements
 - 1. The Contractor shall maintain all planted materials within the contract in accordance with the plans and specifications until one (1) year after the final acceptance and completion of the whole work of the contract.
 - 2. All plants shall be guaranteed to remain alive and healthy for a full twelve (12) month period. Replacements shall be guaranteed an additional twelve (12) months.

- 3. Physical Completion Inspection and Replacements: Notify the Owner's Representative in writing at least ten days prior to requested date of physical completion inspection. Remove and replace dead, unhealthy or badly impaired plants according to the original specification, if so directed. Replace plants during the next planting season if this inspection is not within a planting season.
- 4. Plants will be rejected if root ball has been disturbed or dumped prior to planting.
- 5. End of Guarantee Inspection and Replacements: Remove stakes, guy wires and tree wrapping at the end of the one year guarantee period unless otherwise directed. Inspection of the planting to determine its final acceptance will be made at the conclusion of the guarantee period by the Owner's Representative. No plants will be accepted unless they are alive and healthy. Remove and replace dead, unhealthy or impaired plants according to original specification, as directed. Replace plantings during the next planting season if end of guarantee period is not within a planting season.
- 6. The Contractor shall be liable for any damages to property caused by planting operations and all construction areas disturbed shall be restored to the satisfaction of the Owner's Representative.

3.05 MAINTENANCE

- A. Neatly trim plants where necessary. Preserve the plants' natural character.
- B. Immediately remove clippings after trimming.
- C. Water to prevent soil from drying out.
- D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- E. Apply pesticides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of pesticides.

1.01 SECTION INCLUDES

- A. Concrete Manholes.
- B. Cast iron frames and covers
- C. Non-shrink grout

1.02 RELATED SECTIONS

- A. Section 312318 Trenching
- B. Section 312317 Backfilling

1.03 REFERENCES

- A. ASTM C 443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- B. ASTM C 478 Specification for Precast Reinforced Concrete Manhole Sections
- C. ASTM C 497 Test Methods for Concrete Pipe, Manhole Sections, or Tile
- D. ASTM C 877 Specification for External Sealing Bands for Concrete Pipe, Manholes and Precast Box Sections
- E. ASTM C 923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
- F. ASTM C 990 Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- G. ASTM C 1244 Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
- H. AASHTO M 199M/M 199-05 Precast Reinforced Concrete Manhole Sections
- I. AASHTO T 280 Concrete Pipe, Manhole Sections, or Tile
- J. ASTM C32 Sewer and Manhole Brick (Made from Clay or Shale).

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Precast Concrete Structures: Indicate structure dimensions, sleeve locations and size, concrete strength and location and size of reinforcement.
- C. Provide manufactures data on concrete accessories.
- D. Submit the following related to design mixes:
 - 1. Name, address, and telephone number of Contractor's laboratory.
 - 2. Mix proportions.
 - 3. Source of cement, type, brand and certified copies of mill reports, including physical and chemical analysis.

- 4. Source of fine aggregates and results of tests made in accordance with ASTM C33 and ASTM C40.
- 5. Source of coarse aggregates and results of tests made in accordance with ASTM C33.
- 6. For each mix proposed, make and cure four (4) standard 6-inch concrete test specimens in the lab in accordance with ASTM C192. Furnish compression test results made in accordance with ASTM C39. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
- 7. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
- 8. The Engineer may approve the use of previously established design mixes if all test results, made within the last six (6) months by a recognized testing laboratory, are positive and provide sufficient evidence of full compliance with this specification. If the Engineer determines that insufficient documentation and test results exist, he may request additional testing or he may request a new design mix with complete test results.
- 9. If the adopted mix fails to produce concrete meeting the requirements for strength and placeability, the Engineer may order additional cement or adjustments to mix proportions.

1.05 COORDINATION

- A. Coordinate placement of sleeves for penetrations.
- B. Coordinate with piping installation.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not excavate or backfill during inclement weather or when precipitation is occurring.
- B. Do not backfill over or with wet or frozen materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. OLD CASTLE
- B. LONG ISLAND PRECAST, INC.
- C. COASTAL PIPELINE PRODUCTS CORP.

2.02 MATERIALS

- A. Manhole Frame and Cover: ASTM A-48 cast iron construction, manufactured by Campbell Foundry Company or approved equal, with date of cast on underside of cover, "SEWER" inscription on cover, painted with one coat asphaltum. Pattern No. 1041-195. Frame and cover shall be manufactured in the U.S.A.
- B. Non-Shrink Grout:
 - 1. Cement-Based Grout: Premeasured and prepackaged materials supplied by the manufacturer, requiring only the addition of water. The manufacturer's instructions must be printed on the outside of each bag.
 - 2. Water: Potable, not detrimental to concrete.
 - 3. Use the minimum water necessary for proper installation.
 - 4. Grout Characteristics:
 - a. Non-Shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maxi-mum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.

- c. Setting Time: A minimum initial set time of 60 min-utes when tested in accordance with ASTM C-191.
- d. Composition: Shall not contain metallic particles such as aluminum powders, iron filings, or expansive cement.
- C. Manhole Steps: Copolymer polypropylene plastic steel rein-forced manhole steps, M.A. INDUSTRIES, Model PS2-PF, set into manhole wall.
- D. Precast Reinforced Concrete Manhole Sections: ASTM C478, cylindrical shape.
- E. Brick Units: ASTM C32, Grade MS, solid, shale red brick moisture-controlled, normal weight.
- F. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively.

2.03 ACCESSORIES

A. Pipe Connectors: Elastomeric PVC with Series 300 stainless steel bands by FERNCO, Davison, MI.

2.04 SOURCE QUALITY CONTROL

- A. Notify Engineer at least 48 hours before pouring precast concrete sections.
- B. Mark precast concrete structures in accordance with ASTM C478.
- C. Age precast concrete structures at least two weeks before shipment.
- D. Testing and analysis of concrete shall be performed under the requirements in Section 014500.
- E. The testing laboratory shall take cylinders and perform slump and air entrainment tests in accordance with ACI 301 and Section 014500.

PART 3 - EXECUTION

- 3.01 ERECTION OF CONCRETE STRUCTURES
 - A. Determine required inside diameter of each wall opening, in accordance with manufacturer's recommendation, to assure a water-tight joint, for openings which accommodate penetration seals.
 - B. Place concrete in accordance with ACI 304.
 - C. Fabricate concrete reinforcing in accordance with CRSI 63.
 - D. Ensure reinforcement, sleeves and embedded parts are not disturbed during concrete placement.
 - E. Provide continuous flexible bentonite waterstop at tongue and groove joints. Install waterstop in accordance with manufacturer's installation instructions.
 - F. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

A. Verify that excavation is ready to receive work and excavations, dimensions and elevations are as indicated on drawings.

3.03 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with Type C fill, as defined in Section 312323.
- B. Remove large stones or other hard matter which could damage pipe or impede con-sistent backfilling or compaction.

3.04 INSTALLATION

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Install precast concrete base, shaft and slab top plumb and level.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Adjust lock joint flexible sleeve and install non-shrink grout to provide water-tight pipe penetration.

3.05 SITE TOLERANCES

A. Maximum variation from proposed top of structure elevation: 1/4 inch.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under Section 014500.
- B. Request inspection prior to and immediately after placing backfill.
- C. Perform compaction testing in accordance with Section 014500.
 - 1. If tests indicate Work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.07 PROTECTION

A. Protect structures and appurtenances from damage or displacement until Project is accepted by Owner.

- PART 1 GENERAL
- 1.01 SECTION INCLUDES
 - A. Grease Trap
- 1.02 RELATED SECTIONS
 - A. Section 312316 Excavation.
 - B. Section 312323.13 Backfilling.
 - C. Section 312333 Trenching.
 - D. Section 334123 PVC Pipe.

1.03 REFERENCES

A. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide data on grease trap and septic tank.
 - 1. Include manhole openings, covers, pipe connections, and accessories.
 - 2. Include piping with sizes and invert elevations.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record locations and inverts of buried pipe, components and connections.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

- A. Conform to local Health Department and local Department of Public Works code and regulations for work of this section.
- B. Provide certificate of compliance from local Health Department indicating approval of system.
- 1.07 COORDINATION
 - A. Coordinate work under provisions of Section 013100.
 - B. Coordinate the work with connections to building sanitary sewer piping outlet.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS SEPTIC TANK
 - A. AFCO PRECAST COMPANY, INC.

- B. SUFFOLK COUNTY PRECAST.
- C. COASTAL PIPELINE PRODUCTS CORP.
- D. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 COMPONENTS

A. Grease Trap: ASTM C 1227, precast, reinforced-concrete tank, single unit. Designed for A-16 (HS20-44) traffic loading according to ASTM C 890. Manholes: 30 inch minimum diameter opening with reinforced-concrete risers to grade and heavy-duty adjustable, locking cast iron frame and cover. Dimensions as indicated on plans.

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. Collar Cover: 30 pound asphalt roofing felt.

2.04 FABRICATION

- A. Fabricate and reinforce all sections to the dimensions as indicated on the plans.
- B. Pipe Entry: Provide openings as required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that building sanitary sewer connection, size, location and invert are as indicated.

3.02 PREPARATION

- A. Ream pipe ends and remove burrs.
- B. Remove scale and dirt from components before assembly.
- C. Establish invert elevations for all components in the system.
- D. Hand trim excavations. Remove stones, roots or other obstructions.

3.03 INSTALLATION

- A. Form bottom of excavations clean and smooth to correct elevation. Compact bottom of the excavations to a minimum of 95 percent of maximum dry density.
- B. Place structures on firm, level surface. Utilize a placement method which will not damage or crack the structure.
- C. Place sections plumb and level, trim to the 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. Mount castings in a 1 inch mortar bed over access opening in slab or dome top. Install firm, level and to the required elevation.
- F. If required to achieve proper elevation of casting, adjust with brick and mortar. A minimum height of 6 inches and maximum height of 12 inches is permitted between the slab or dome top and the base of the casting. Maximum distance between brick surfaces is to be 1 inch.
- G. Backfill in annulus surrounding the structures in 6 inch compacted layers. Refer to Section 312323.13.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.
- B. Request inspection by Engineer and local Health Department or Public Works Department prior to backfilling.
- C. Perform compaction testing in accordance with ANSI/ASTM D1557.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to the Owner.
- E. Frequency of Tests:
 - 1. Precast Concrete Structures: One compaction test for every 5 vertical feet of structure.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect system from damage until project is accepted by the Owner.

1.01 ECTION INCLUDES

- A. Corrugated polyethylene pipe.
- B. Fittings and accessories.

1.02 RELATED SECTIONS

A. Section 312000 - Earth Moving.

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 312000.

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 312000.

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.

1.01 SECTION INCLUDES

- A. Rip rap.
- B. Filter Bed.
- C. Filter Fabric.

1.02 RELATED REQUIREMENTS

- A. Section 312213: Rough Grading: Grading of subgrade.
- B. Section 312316: Excavation: Excavating for rip rap.

1.03 REFERENCES

- A. ANSI/ASTM C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- B. ANSI/ASTM C136 Method for Sieve Analysis of fine and coarse aggregates.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data for filter fabric.
- C. Sieve Analysis: Indicate stone sizes and weights for rip rap and provide a sieve analysis for the filler stone and filter bedding.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Rip rap when subjected to 10 cycles of the magnesium sulfate soundness test in accordance with ANSI/ASTM C88 shall have a weight loss of not more than 10%.
- B. Do not place bedding on frozen, wet, or spongy subgrade.

PART 2 PRODUCTS

New Fire Headquarters

2.01 MATERIALS

- A. Rip Rap: Granite type; broken stone and irregular shaped rock with a minimum specific gravity of 2.5; solid and nonfriable.
- B. Filler Stone: Small diameter stone; washed, freed of silt, clay, shale, loam, firable or sluble materials or organic matters; sized to fill voids in the rip rap, minimum size of 1/2 inch.
- C. Filter Bed: Well graded gravel or sand-gravel; washed, free of silt, clay, shale, loam, friable or soluble materials or organic matter; gradded in accordance with ANSI/ASTM C136 within the following limits

| Sieve Size Percent by | | ight Passing |
|---------------------------------|------------|--------------|
| 4 in | 100 | |
| 1 in | 15 to 60 | |
| 1/4 in | 0 to 25 | |
| TRFD2302 | 334119 - 1 | lss |
| Thiells Roseville Fire District | | |

No. 40

0 to 10

- D. Filter Fabric: Needle punched, non-woven geotextile fabric; resistant to bacteria and fungus with the following properties:
 - 1. Grab Tensile Strength: 390 lb.
 - 2. Elongation: 95%
 - 3. Trapezoid Tear Strength: 180 lb.
 - 4. Puncture Strength: 200 lb.
 - 5. Burst Strength: 600 psi
 - 6. Equivalent Opening Size (EOS): No. 100 U.S. Sieve (max.)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions under provisions of Section 013100.
- B. Verify subgrade is properly compacted, to the appropriate grade and ready to receive work of this section.

3.02 INSTALLATION

- A. Place the filter fabric to the dimensions indicated on the plans.
- B. Place the gravel filter bed over the fabric to the dimensions indicated on the plans.
- C. Place riprap at locations and to the dimensions as indicated on the plans.
- D. Place stones in a staggered pattern. Place larger stones at the base of slopes.
- E. As riprap is placed, fill voids with filler stone so that the finished product is a dense, well graded mass of stone, with a minimum of voids.
- F. Do not place riprap by dumping through chutes or other methods which may cause segregation of stone sizes.
- G. Do not disturb the underlying base or filter bed during riprap placement.

1.01 SECTION INCLUDES

- A. PVC pipe for sewers and 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.

2.03 ACCESSORIES

A. Marking Tape - Solid plastic tape with a minimum total thickness of 4.5 mil. Tape resilient to alkalis, acids, and other destructive elements; of sufficient strength that layers cannot be separated by hand or by exposure to boiling water for a period of three hours. Green in color, minimum 3" wide with the words "Caution - Sanitary Sewer" repeated every 16-36 inches, conforming to AWPA uniform color code.

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.

1.01 SECTION INCLUDES

- A. Precast concrete catch basins and field inlets.
- B. Castings.
- 1.02 RELATED SECTIONS
 - A. Section 312000 Earth Moving.
 - B. 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. SUFFOLK COUNTY PRECAST CORP.
- C. COASTAL PIPELINE PRODUCTS CORP.
- D. 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.

1.01 SECTION INCLUDES

- A. Cast-in-place Formed Trench Drain Units.
- B. Trench Forms
- C. Removable Grating Systems.

1.02 RELATED SECTIONS

- A. Section 312316 EXCAVATION.
- B. Section 312323.13 BACKFILL.
- C. Section 334124.24 PVC DRAINAGE PIPE.

1.03 REFERENCES

- A. AASHTO (American Association of State Highway and Transportation Officials)
- B. ASTM A48/A48M Gray Iron Castings.
- C. ASTM A536 Specification for Ductile Iron Castings.
- D. ASTM D3212 Specification for joints for drain and sewer plastic pipes using flexible elastomeric seals.
- E. ASTM D3034 Specification for sewer PVC pipe and fittings.
- F. ASTM F1336 Specification for PVC gasketed sewer fittings.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 SUBMITTALS.
- B. Shop Drawings: Indicate dimensions and details of complete Trench Drain System including but not limited to: Concrete, Forms, Gratings, accessories and connections to drainage facilities.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500 PRODUCT DELIVERY, STORAGE AND HANDLING.
- 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 or damaged materials will be rejected.

1.06 COORDINATION

A. Coordinate work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.

B. Coordinate with excavation, forming and installation, concrete encasement, backfilling, installation of connections to drainage piping and all other work for a complete drainage system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. ABT, INC: Trenchformer MHD12 Trench Forming System with HighIntake Grate manufactured by Advanced Building Technologies. Inc. or approved equal.
- B. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

- A. Forms F12GR: Pre-manufactured trench forms using recyclable non CFC EPS foams. Forms to be round bottom, pre-sloped or non-sloped. Form segments are 12" (305 mm) wide. Trench width created to be within 1/16" (1.58mm) of specified. Invert slope per application requirement as noted on plans. Non-sloping sections must have written approval by engineer prior to installation. Form work to be anchored against floatation to the earth without penetrating the subgrade using steel no-float legs and an anchor slab pour. Means to assure constant rail spacing and grate seat dimension must be provided. Non-petroleum-based form release is to be used for smooth interior walls and easy form removal.
- B. Grating 12.502F.GB: Uncoated ductile iron high intake slotted grates. Grates to have a 0.699 FT²/LFt (0.213 m²/Lm) open area. Grates shall pass a proof load of 100,000 lbs per FAA Spec. AC 150/5320-6. Additionally, grates shall pass a proof load of 1,235 psi applied to 9-inch-wide x 9-inch-long load contact area per AASHTO M-306 test method. Grates must be flush with top of rails. Covers are non-rigidly retained at each grate corner with a zinc plated 0.38" x 0.9" ductile iron lock bar. Cover retention and location performance shall not degrade with service loads or thermal cycles.
- C. Frames / Rails GD2E: Black polymer coated 2.00" x 2.00" x 0.188" (50.8 mm x 50.8 mm x 4.8 mm) steel rails furnished with standard headed concrete anchors conforming to or exceeding American Concrete Institute's specifications. Rails to provide a minimum of 1.25 square inches concrete bearing area per inch of trench length on each side. Auxiliary frames are to be used as noted on plans to facilitate radii, intersections, grade changes and expansion, control & construction joints. Load bars are to be installed as noted on the plans to reinforce rails where unsupported by concrete.

2.03 FABRICATION

A. Pipe Entry: Provide pipe connection openings and caps as required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing site conditions under provisions of Section 013100 PROJECT MANAGEMENT AND COORDINATION.
- 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 correct elevation. Compact bottom of the excavation to a minimum of 95 percent of maximum dry density.
- B. Place drainage trench sections plumb and level, trim to correct elevations.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans.
- D. Provide thickness of concrete encasement to achieve for loading as per the manufacturer's recommendations.
- E. All drainage inlets must be installed in accordance with all applicable local, state and federal regulations. Refer to manufacturer's installation guidelines.
- F. Connect system to drainage piping and site drainage system as indicated on the drawings.

3.03 TOLERANCES

- A. Maximum Variation from Proposed Rim Elevation: 1/8 inch.
- B. Maximum Variation from Proposed Location: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500 QUALITY CONTROL.
- B. Request inspection prior to backfilling around trench drain and prior to concrete pour.
- C. Post Construction Inspection: Form work is to be fully removed, without exception, to allow for inspection and if needed repair of any voids and or concrete consolidation issues below the frame, trench walls and invert. Grate and grate retainer inspection shall be performed to ensure that all grates and retainers are installed and are properly seated in place.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000 TEMPORARY FACILITIES AND CONTROLS.
- B. Protect drainage inlets from damage or displacement until project is accepted by the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Precast concrete stormwater treatment unit.

1.02 RELATED SECTIONS

- A. Section 312316 Excavation.
- B. Section 312323.13 Backfilling.
- C. Section 312319 Dewatering.

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.
- G. ASTM D4097 Contact Molded Glass Fibre Reinforced Chemical Resistant Tanks.

1.04 SYSTEM DESCRIPTION

- A. System shall include a stormwater treatment unit capable of removing oil and sediment from stormwater. System shall include a high flow bypass and all equipment and materials necessary for system installation.
- B. System shall be capable of operating under submerged tidal conditions.

1.05 PERFORMANCE REQUIREMENTS

- A. The treatment device shall be capable of achieving an 80 percent average annual reduction in the total suspended solid load or treat a flow rate designated by the jurisdiction in which the project is located. Both methods should be sized using the OK-110 particle distribution having particles ranging from 53 microns to 212 microns with a d50 of around 110 microns.
- B. The treatment device shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The minimum storage capacity provided by the sump chamber shall be in accordance with the volume listed in Table 1. The boundaries of the sump chamber shall be limited to that which do not degrade the stormwater treatment device's treatment efficiency as captured pollutants accumulate. In order to not restrict the Owner's ability to maintain the stormwater treatment device, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter.
- C. The stormwater treatment device shall convey the flow from the peak storm event of the drainage network, in accordance with required hydraulic upstream conditions as defined by the Engineer. If a substitute stormwater treatment device is proposed, supporting documentation

shall be submitted that demonstrates equal or better upstream hydraulic conditions compared to that specified herein. This documentation shall be signed and sealed by a Professional Engineer registered in the State of the work. All costs associated with preparing and certifying this documentation shall be borne solely by the Contractor.

D. The stormwater treatment system manufacturer shall furnish documentation which supports all product performance claims and features, storage capacities and maintenance requirements.

1.06 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and details of treatment unit and castings.
- C. Design Data: Provide calculations substantiating removal efficiencies and correlation to field monitoring results using both particle size and TSS removal.
- D. Design Data: Provide data that the stormwater treatment system does not scour previously captured pollutants based on the particle size specified. Performance data should include laboratory testing with an initial sediment load of 50% of the unit's sediment capacity at an operating rate of 125% or greater.
- E. Manufacturers Instructions: Submit manufacturer's installation instructions.

1.07 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.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

1.09 COORDINATION

A. Coordinate with installation of piping and all other work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cascade CS-4 unit by Contech Engineered Solutions LLC.
- B. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

A. Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Concrete for precast stormwater treatment systems shall conform to ASTM C 857 and C 858 and meet the following additional requirements:

- 1. Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2. Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 3. Cement shall be Type II Portland cement conforming to ASTM C150.
- 4. Aggregates shall conform to ASTM C33;
- 5. Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A615, A1064;
- 6. Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990;
- 7. Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.
- B. Internal Components and appurtenances shall conform to the following:
 - 1. Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;
 - 2. Support brackets shall be manufactured of 5052 aluminum
 - 3. Fiberglass components shall conform to applicable sections of ASTM D-4097
 - 4. Access system(s) conform to the following: Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

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.
- 2.04 FABRICATION
 - A. Shaft Construction: Concentric with cone top section; lipped male/female joints with watertight rubber gasket.
 - B. Pipe Entry: Provide openings as required.
 - C. Fiberglass insert to be bolted and sealed watertight inside concrete unit.

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. Exercise care in the storage and handling of the stormwater treatment device components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.

- B. The stormwater treatment device shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.
- C. Fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. Trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.
- D. Remove all loose material and pooling water from the stormwater treatment device prior to the transfer of operational responsibility to the Owner.

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 unit from damage or displacement until project is accepted by the Owner.

END OF SECTION

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 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

PART 1 - GENERAL

1.01 1.01 - SECTION INCLUDES

- A. Timber guide rail.
- 1.02 1.02 RELATED SECTIONS
 - A. Section 312316 Excavation.
 - B. Section 312323.13 Backfill.
- 1.03 1.03 REFERENCES
 - A. ANSI/ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - B. ASTM A36 Structural Steel.
 - C. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - D. ASTM C150 Portland Cement.

1.04 1.04 - SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Shop drawings of entire timber guide rail system.

PART 2 - PRODUCTS

2.01 2.01 - MATERIALS

- A. Timber: Southern yellow pine SPIB Grade No. 1 SR; size and dimensions as indicated on the plans.
- B. Straps and Plates: ASTM A36 structural steel sections, size as indicated on the plans.

2.02 2.02 - ACCESSORIES

- A. Concrete: 3,500 psi strength at 28 days, 3 inch slump, made from the following materials:
 - 1. Cement: ASTM C150 Portland cement, Type IA air entrained.
 - 2. Sand: Natural river or bank sand, washed, free of silt, clay, loam, friable or soluble materials, organic matter and debris.
 - 3. Coarse Aggregate: Angular crushed stone, 3/4 inch nominal size, washed, free of shale, clay, friable or soluble materials, organic matter and debris.
 - 4. Water: Clean and not detrimental to concrete.
- B. Hardware: ASTM A153 galvanized steel; bolts, nuts and washers to suit rail profile.
- C. Wood Preservative (Surface Application): AWPA M4, copper naphthenate having a minimum 2 percent metallic solution.

2.03 2.03 - FINISHES

- A. Hardware: Galvanized to ASTM A153, 3.6 oz/sq ft coating.
- 2.04 2.04 FABRICATION
- 2.05 FABRICATE ALL TIMBER IN ACCORDANCE WITH AWPB STANDARDS (LP-22).

PART 3 - EXECUTION

3.01 3.01 - INSTALLATION

- A. Install posts to the dimensions indicated on the plans.
- B. Excavate as required to install posts at locations shown on the plans.
- C. Set posts plumb.
- D. Attach rails securely to posts with anchoring hardware. Splice rails only at posts.
- E. Mounting bolts shall be torqued to 50 percent of their average failure value.

3.02 3.02 - ERECTION TOLERANCES

- A. Posts Maximum Variation From Plumb: 1/4 inch.
- B. Rail Maximum Offset From True Position: 1/2 inch.
- C. Rail Maximum Variation From True Height: 1/2 inch.

END OF SECTION

APPENDIX A: GEOTECHNICAL REPORT



REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED FIRE STATION 63 - 69 WEST RAMAPO ROAD & ONE ANGELUS DRIVE GARNERVILLE, TOWN OF HAVERSTRAW ROCKLAND COUNTY, NEW YORK



Prepared for:

THIELLS ROSEVILLE FIRE DEPARTMENT P.O. Box 186 Garnerville, New York 10923 Prepared by:

WHITESTONE ASSOCIATES ENGINEERING & GEOLOGY NY, PLLC 30 Independence Boulevard Suite 250 Warren, New Jersey 07059

Mudar Khantamr, PE Senior Associate

Kellen

Laurence W. Keller, PE Vice President

Office Locations:

September 23, 2024

Whitestone Project No.: GJ2422032.Y00



September 23, 2024

via email

THIELLS ROSEVILLE FIRE DEPARTMENT

P.O. Box 186 Garnerville, New York 10923

Attention: Mr. Robert Masiello Board of Fire Commissioners

Regarding: REPORT OF GEOTECHNICAL INVESTIGATION PROPOSED FIRE STATION 63 - 69 WEST RAMAPO ROAD & ONE ANGELUS DRIVE GARNERVILLE, TOWN OF HAVERSTRAW ROCKLAND COUNTY, NEW YORK WHITESTONE PROJECT NO.: GJ2422032.Y00

Dear Mr. Masiello:

Whitestone Associates Engineering & Geology NY, PLLC (Whitestone) is pleased to submit the attached *Report of Geotechnical Investigation* for the above-referenced project. The attached report presents the results of Whitestone's soils exploration efforts and presents recommendations for design of the proposed structural foundations, floor slabs, pavements, and related earthwork associated with the proposed development.

Whitestone's Geotechnical Division appreciates the opportunity to be of service to Thiells Roseville Fire Department. Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein. Please contact us with any questions regarding the enclosed report.

Sincerely,

WHITESTONE

Mudar Khantamr, PE Senior Associate

JS/rb L:\Job Folders\2024\2422032GJ\Reports and Submittals\22032 ROGI.docx Enclosures Copy: Rachael L. Grodzki, H2M Architects & Engineers David Sherland, AIA, H2M Architects & Engineers

MASSACHUSETTS

Laurence W. Keller, PE Vice President

CONNECTICUT

Florida

REPORT OF GEOTECHNICAL INVESTIGATION

Proposed Fire Station 63 - 69 West Ramapo Road & One Angelus Drive Garnerville, Town of Haverstraw Rockland County, New York

TABLE OF CONTENTS

| SECTION 1.0 | SUMMARY OF FINDINGS1 | | |
|-------------|--|---|--|
| SECTION 2.0 | INTRODUCTION | 2 | |
| SECTION 2.0 | | | |
| 2.1 | AUTHORIZATION | | |
| 2.2 | PURPOSE | | |
| 2.3 | SCOPE | | |
| | 2.3.1 Field Exploration | | |
| | 2.3.2 Laboratory Program | | |
| | 2.3.3 Infiltration Testing | 2 | |
| SECTION 3.0 | SITE DESCRIPTION | 6 | |
| 3.1 | LOCATION AND DESCRIPTION | 6 | |
| 3.2 | EXISTING CONDITIONS | 6 | |
| 3.3 | SITE GEOLOGY | 6 | |
| 3.4 | PROPOSED CONSTRUCTION | 7 | |
| SECTION 4 0 | SUBSURFACE CONDITIONS | 0 | |
| SECTION 4.0 | | | |
| 4.1 | SUBSURFACE SOIL CONDITIONS | 8 | |
| 4.2 | GROUNDWATER | 8 | |
| SECTION 5.0 | CONCLUSIONS AND RECOMMENDATIONS | 9 | |
| | | | |
| 5.1 | GENERAL | | |
| 5.2 | SITE PREPARATION AND EARTHWORK | | |
| 5.3 | STRUCTURAL FILL AND BACKFILL | | |
| 5.4 | GROUNDWATER CONTROL 1 | | |
| 5.5 5.6 | FOUNDATIONS | | |
| 5.6 5.7 | PAVEMENT DESIGN CRITERIA | - | |
| 5.8 | RETAINING WALLS/LATERAL EARTH PRESSURES | | |
| | | | |
| 5.9 5.10 | SEISMIC AND LIQUEFACTION CONSIDERATIONS | | |
| 5.10 | SUPPLEMENTAL POST INVESTIGATION SERVICES | | |
| 5.11 | SUTTERVIAL TOST INVESTIGATION SERVICES | ' | |
| SECTION 6.0 | GENERAL COMMENTS1 | 9 | |
| | | | |

REPORT OF GEOTECHNICAL INVESTIGATION

Proposed Fire Station 63 - 69 West Ramapo Road & One Angelus Drive Garnerville, Town of Haverstraw Rockland County, New York

TABLE OF CONTENTS

FIGURES

FIGURE 1 Test Location Plan

APPENDICES

- APPENDIX A Records of Subsurface Exploration
- APPENDIX B Laboratory Test Results
- APPENDIX C Infiltration Test Results
- APPENDIX D Supplemental Information (USCS, Terms & Symbols)

SECTION 1.0 Summary of Findings

Whitestone has conducted an exploration and evaluation of the subsurface conditions at the subject site located at 63 through 69 West Ramapo Road and One Angelus Drive in Garnerville, Town of Haverstraw, Rockland County, New York. The site of the proposed redevelopment is shown on the *Boring Location Plan* included as Figure 1.

At the time of Whitestone's site investigation, the subject site housed a lightly wooded area and residential development with associated pavements, landscaping, and utilities. Based on information provided by H2M Architects & Engineers (H2M) including the February 29, 2024 *Request for Proposal* (RFP) and *Soil Boring Locations* prepared by H2M, the proposed redevelopment is anticipated to include demolishing the existing structures and constructing an approximately 15,000-square feet (footprint), three-story fire station with associated new pavements, stormwater management (SWM) areas, landscaping, and utilities. The proposed building is not anticipated to include a below-grade level, however, site retaining walls may be required.

The subsurface exploration included conducting a reconnaissance of the project site, drilling soil test borings, conducting in-situ infiltration testing, and collecting soil samples for laboratory analyses. The data from this exploration was analyzed by Whitestone in light of the project information provided by H2M.

A summary of Whitestone's findings is presented in the following:

► Subsurface Conditions: The borings were conducted within both existing grass areas and existing asphalt paved areas and encountered approximately three inches to six inches of topsoil and three inches asphaltic concrete pavement with no apparent subbase materials at the surface. Underlying the surface cover, existing fill was encountered within all the borings generally consisting of a mixture of sand, silt, and gravel. The existing fill in borings SB-1 through SB-5 extended to depths ranging between approximately two feet below ground surface (fbgs) and six fbgs. The existing fill in borings SB-6 and SB-7 extended to a depth of approximately 10 fbgs. The deeper existing fill is anticipated to be associated with the raised site grades near the eastern existing building, however, deeper existing fill could be encountered between the widely spaced borings. Beneath the existing fill, the borings encountered natural glacial deposits generally composed of a mixture of sand, silt, and gravel (USCS: SM, SP, ML, GP, and GP-GM). The borings were terminated within the glacial deposits at depths ranging from approximately 8.5 fbgs to 31 fbgs due to auger refusal. Static groundwater was encountered within a majority of the borings at approximate depths ranging from eight fbgs to 20 fbgs. Static and perched/trapped water conditions are expected to fluctuate seasonally and following periods of precipitation.

Recommendations developed upon consideration of these results are summarized below and presented in greater detail in the following report.

- ► Foundations: Following overexcavation of existing fill, Whitestone recommends supporting the proposed structures on conventional shallow spread and continuous wall footings designed to bear within the underlying natural soils and/or on controlled structural fill materials that are properly placed and compacted as described herein. Foundations bearing within these materials may be designed using a maximum allowable net bearing pressure of 3,000 pounds per square foot (psf). Due to anticipated disturbance of upper portions of the subgrade soils during footing excavations, all footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Localized areas may require additional overexcavation and replacement with approved on-site soils in controlled lifts.
- ► Floor Slabs and Pavements: Following supplemental construction phase evaluation of existing fill and subgrade inspection and improvement as described herein, Whitestone anticipates that proposed floor slabs and pavements may be supported on improved and approved existing fill, the underlying natural soils, and/or controlled structural fill materials subject to supplemental evaluation and subgrade preparation as described herein with areas of overexcavation and recompaction or replacement anticipated due to the moisture sensitivity of the upper site soils and inherent variability that exists within existing fill, evidenced by the sporadic N-values.
- ► Soil Reusability/Moisture Sensitivity: Whitestone anticipates that the majority of the existing fill and the underlying natural soils will be suitable for selective reuse as structural fill and/or backfill below proposed foundations, floor slabs, and pavements provided objectionable debris are segregated and moisture contents are controlled within two percent of the optimum moisture content. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and/or test pit excavations during construction as recommended herein. Materials that become exceedingly wet will require discing and aerating. The stripped asphaltic concrete pavement and/or topsoil should not be used as general structural fill or backfill.

More detailed design criteria and construction recommendations for proposed foundations, slabs, pavements, and earthwork are discussed in the following report.

SECTION 2.0 Introduction

2.1 AUTHORIZATION

Mr. Robert Masiello with Theills Roseville Fire Department issued authorization to Whitestone to conduct the geotechnical investigation at this site relevant to the proposed fire station redevelopment located at 63 through 69 West Ramapo Road and One Angelus Drive in Garnerville, Town of Haverstraw, Rockland County, New York. The geotechnical investigation was conducted in general accordance with Whitestone's proposal dated June 6, 2024.

2.2 PURPOSE

The purpose of this subsurface exploration and analysis was to:

- ► ascertain the various soil profile components at test locations;
- ▶ estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- ► provide geotechnical criteria for use by the design engineers in preparing the foundation, floor slab, and pavement design;
- ▶ provide recommendations for required earthwork and subgrade preparation;
- ► record groundwater levels (where encountered) at the time of the investigation and discuss the potential impact on the proposed construction; and
- ► recommend additional investigation and/or analysis (if warranted).

2.3 SCOPE

The scope of the exploration and analysis included the subsurface exploration, field testing and sampling, laboratory analyses, and a geotechnical engineering analysis and evaluation of the subsurface materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions related to the physical support of the proposed construction.

2.3.1 Field Exploration

The field exploration of the project site was conducted by means of seven test borings (identified as SB-1 through SB-7) to depths ranging from approximately 8.5 fbgs to 31 fbgs and conducting two *in-situ*

infiltration tests (identified as I-1 and I-2) utilizing cased borehole infiltrometer methodology. The borings were conducted with a truck-mounted Diedrich D50 drill rig using hollow stem augers and split-spoon sampling techniques. The borings were backfilled with excavated soils generated from the investigation and surficially patched with asphaltic concrete cold-patch, where appropriate. The locations of the subsurface tests are shown on the accompanying *Test Location Plan* included as Figure 1.

The borings were conducted in the presence of Whitestone personnel who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The boring locations were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

The borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The Standard Penetration Resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately following the completion of the testing operations within the borings and test excavations. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

2.3.2 Laboratory Program

Representative samples of selected strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216), and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. Quantitative test results are provided in Appendix B.

| PHYSICAL/TEXTURAL ANALYSES SUMMARY | | | | | | | |
|------------------------------------|------------------|-----------------|---------------------------------|------------------------------------|---------------------|----------------------|------------------------|
| Source of Sample | Sample Number | Depth (fbgs) | Passing No. 200 Sieve (%) | Natural Moisture Content (%) | Liquid Limit (%) | Plastic Index (%) | USCS Classification |
| SB-1 | S-3 | 4.0 to 6.0 | 9.8 | 3.4 | Non-Plastic GP-GM | | GP-GM |
| SB-2 | S-4 | 6.0 to 8.0 | 18.3 | 7.8 | 23 | NP | SM |
| SB-5 | S-4 | 6.0 to 8.0 | 27.0 | 7.5 | 19 | 2 | SM |

WHITESTONE

The engineering classifications are useful when considered in conjunction with the additional site data to estimate properties of the soil types encountered and to predict the soil's behavior under construction and service loads.

2.3.3 Infiltration Testing

Infiltration testing was conducted at the anticipated level of infiltration within at tests I-1 and I-2. Infiltration testing was conducted in general accordance with the New York State Stormwater Design Manual. The tests conducted resulted in infiltration rates of 19 inches per hour (iph) and 0.25 iph. Infiltration test results are provided in Appendix C.

SECTION 3.0 Site Description

3.1 LOCATION AND DESCRIPTION

The subject site is located at 63 through 69 West Ramapo Road and One Angelus Drive in Garnerville, Town of Haverstraw, Rockland County, New York. The site is bound to the north by residential development followed by Elizabeth Place, and to the east by a wooded area followed by Central Highway, to the south by residential development followed by Moorea Court, and west by A Ramapo Road followed by residential development. The site of the proposed construction is shown on the *Test Location Plan* included as Figure 1.

3.2 EXISTING CONDITIONS

Surface Cover/Development: At the time of Whitestone's site investigation, the subject site housed a lightly wooded area and residential development with associated pavements, landscaping, and utilities.

Topography: Based on existing topography indicated on the December 19, 2023 *Boundary & Topographic Survey* prepared by AN&Z P.C., the site has a grade change of approximately 15 feet across the property and approximately five feet within the area of the proposed building footprint.

Utilities: At the time of Whitestone's subsurface field investigation, the subject site was serviced by public and private utilities including underground electric, gas, storm, sanitary, and water lines. Other utilities were not observed at the subject site by Whitestone but may be present. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

Site Drainage: Surface run-off for the site generally follows existing topography draining towards inlets located within paved portions of the site. The termini of the inlets are unknown.

3.3 SITE GEOLOGY

The site is located within the New England Uplands Physiographic Province of New York. Specifically, the site is underlain by the Brunswick Formation of the Newark Group, which mainly consists of sandstone and conglomerate. The overburden soils generally consist glacial till deposited from the Wisconsinan Glacier. Glacial till beneath the subject site typically contains a heterogeneous mixture of sand, silt, clay and gravel mixed with variable amounts of boulders and cobbles. Overburden materials also include manmade fill associated with past and present development of the subject site.

3.4 PROPOSED CONSTRUCTION

Based on information provided by H2M including the RFP and *Soil Boring Locations* prepared by H2M, the proposed redevelopment is anticipated to include demolishing the existing structures and constructing an approximately 15,000-square feet (footprint), three-story fire station with associated new pavements, SWM areas, landscaping, and utilities. The proposed building is not anticipated to include a below-grade level, however, site retaining walls may be required.

Detailed grading information was not provided at this time of this report, however, based on existing grades, the proposed building is anticipated to be redeveloped at or near existing grades within maximum cuts/fills on the order of approximately one foot to three feet.

The anticipated maximum design loads are expected to be less than the following:

- ► column loads 225 kips;
- ► wall loads 3.0 kips/linear foot; and
- ► floor slabs 125 pounds per square foot.

The scope of Whitestone's investigation and the professional advice contained in this report were generated based on the project details noted herein. Any revisions or additions to the design details enumerated in this report should be brought to the attention of Whitestone for additional evaluation as warranted.

SECTION 4.0 Subsurface Conditions

Details of the subsurface materials encountered are presented on the *Records of Subsurface Exploration* presented in Appendix A of this report. The subsurface soil conditions encountered in the borings consisted of the following generalized strata in order of increasing depth.

4.1 SUBSURFACE SOIL CONDITIONS

Surface Cover: The borings were conducted within both existing grass areas and existing asphalt paved areas and encountered approximately three inches to six inches of topsoil and three inches asphaltic concrete pavement with no apparent subbase materials at the surface.

Existing Fill: Underlying the surface cover, existing fill was encountered within all the borings generally consisting of a mixture of sand, silt, and gravel. The existing fill in borings SB-1 through SB-5 extended to depths ranging between approximately two fbgs and six fbgs. The existing fill in borings SB-6 and SB-7 extended to a depth of approximately 10 fbgs. The deeper existing fill is anticipated to be associated with the raised site grades near the eastern existing building, however, deeper existing fill could be encountered between the widely spaced borings. SPT N-values within the existing fill ranged between two blows per foot (bpf) to 24 bpf.

Glacial Deposits: Beneath the existing fill, the borings encountered natural glacial deposits generally composed of a mixture of sand, silt, and gravel (USCS: SM, SP, ML, GP, and GP-GM). The borings were terminated within the glacial deposits at depths ranging from approximately 8.5 fbgs to 31 fbgs due to auger refusal. SPT N-values within coarse-grained portions of this stratum ranged between seven bpf and greater than 50 bpf, generally indicating loose to very dense relative density.

4.2 **GROUNDWATER**

Static groundwater was encountered within a majority of the borings at approximate depths ranging from eight fbgs to 20 fbgs. Static and perched/trapped water conditions are expected to fluctuate seasonally and following periods of precipitation.

SECTION 5.0 Conclusions and Recommendations

5.1 GENERAL

Whitestone recommends supporting the proposed structures on conventional shallow foundations bearing within the underlying natural site soils and/or controlled structural fill soils that are properly inspected, placed, and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report. Existing fill should be overexcavated where encountered at or below proposed foundation bearing elevations.

Whitestone anticipates that proposed floor slabs and pavements may be supported on approved and improved existing fill, underlying natural soils, and/or controlled structural fill materials subject to supplemental evaluation and subgrade preparation as described herein with limited areas of recompaction, overexcavation and replacement anticipated due to the due inherent variability that exists within the existing fill. Based on the variable conditions of the existing fill, preparation for slab work and subgrade shall be closely followed and inspected in accordance with Sections 5.2, 5.3, and 5.6. Additional inspection and ground improvement may be required if soft or loose conditions are identified.

5.2 SITE PREPARATION AND EARTHWORK

Surface Cover Stripping and Demolition: Prior to stripping operations, all utilities should be identified and secured. The existing structures and pavements to be demolished and stripped should be removed from within and at least five feet beyond the limits of areas requiring structural fill. Existing structural elements, such as foundation walls, or any concrete foundations, walls or slabs should be removed entirely from below proposed foundations and their zones of influence (as determined by lines extending at least one foot laterally beyond footing edges for each vertical foot of depth) and excavated to at least two feet below proposed construction subgrade levels elsewhere. Foundations and slabs may remain in place below these depths below proposed ground-supported slabs, pavements and landscaped areas, provided interference with future construction is avoided, however, any existing slab to remain should be thoroughly broken such that maximum particle size is 12 inches to allow vertical drainage of water. The demolition contractor should be required to conduct all earthwork in accordance with the recommendations in this report including backfilling any excavation, utility, etc. with structural fill. All fill or backfill placed in structural areas during any demolition operations should be placed as structural fill in accordance with Section 5.2, 5.3, and 5.11 of this report.

Surface Preparation/Proofrolling: Prior to placing any fill or subbase materials to raise or restore grades to the desired subgrade elevations, the existing exposed soils should be compacted to a firm surface with several passes in two perpendicular directions of a minimum 10-ton roller. The roller should be operated

in the static mode or a kneading "sheepsfoot" roller should be used if silt and/or clay soils are encountered at subgrade elevations. The surface then should be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets which may require removal and replacement or further investigation. Proofrolling should be conducted after a suitable period of dry weather to avoid degrading an otherwise stable subgrade. Any fill or backfill should be placed and compacted in accordance with Section 5.3.

Weather Performance Criteria: Because the site soils may soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade soils.

Subgrade Protection and Inspection: Every effort should be made to minimize disturbance of the on-site materials by construction traffic and surface runoff. The on-site soils will deteriorate when subjected to repeated wetting and construction traffic and likely will require extensive drying or overexcavation and replacement. Construction schedules and budgets should account for contingencies, such as importing materials to raise grades or restore overexcavations when construction must occur following wet weather or on an expedited basis. However, if properly protected and maintained during warm, dry weather as recommended herein, the site soils will provide adequate support for the proposed construction. The site contractors should employ necessary means and methods to protect the subgrade including, but not limited to the following:

- leaving the existing pavement in place as long as practical to protect the subgrade from freeze-thaw cycles and exposure to inclement weather;
- ► sealing exposed subgrade soils on a daily basis with a smooth drum roller operated in static mode;
- ► regrading the site as needed to maintain positive drainage away from construction areas;
- ► removing wet surficial soils and ruts immediately; and
- ► limiting exposure to construction traffic especially following inclement weather and subgrade thawing.

5.3 STRUCTURAL FILL AND BACKFILL

Imported Fill Material: Any imported material placed as structural fill or backfill to raise elevations or restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 20 percent of material finer than a #200 sieve. Alternatively,

inorganic soil types including silty and clayey sands and gravels with higher percentage of fine material and silts and clays with a liquid limit less than 40 and a plasticity index less than 20 may be considered subject to the owner's approval, provided that the required moisture content and compaction controls are met. The material should be free of clay lumps, organics and deleterious material.

On-Site Material: Based on the conditions disclosed by the borings, Whitestone anticipates that the majority of the existing fill and underlying natural soils will be suitable for selective reuse as structural fill and/or backfill below proposed foundations, floor slabs, and pavements provided any objectionable debris are segregated and moisture contents are controlled within two percent of the optimum moisture content. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and/or test pit excavations during construction as recommended herein. The reuse of the fine-grained soils and granular soils with an appreciable amount of fines typically is possible only during ideal weather conditions. Reuse of these soils is expected to require mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. The on-site soils will become increasingly difficult to reuse and compact where wetted beyond the optimum moisture content. Immediate re-use of on-site soil should not be anticipated.

Materials that become exceedingly wet likely will require discing and aerating which may not be practical during wet seasons. Alternatively, imported fill materials may be used to attain the desired grades and expedite earthwork operations. The stripped asphaltic concrete pavement and/or topsoil should not be used as fill or backfill.

Demolition Material: Demolition material, free of environmental restrictions, may be used as fill material provided the material is properly segregated and processed as recommended herein. Concrete masonry materials should be crushed to a well graded blend with a maximum size of three inches in diameter. Stripped asphaltic materials and deleterious building materials such as wood, insulation, metal shingles etc. should not be used as general structural fill material. Milled or reclaimed asphalt pavement (RAP) may be re-used as granular base or stabilizing materials provided that the RAP particle size meets New York State Department of Transportation (NYSDOT) standard specifications for granular base and no more than 50 percent of the pavement granular base contains RAP.

Compaction and Placement Requirements: All fill and backfill should be placed in maximum eightinch loose lifts and compacted to 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor) unless otherwise recommended in subsequent sections of this report. Whitestone recommends using a vibratory drum roller to compact the on-site soils or a small hand-held vibratory compactor within excavations.

Structural Fill Testing: A sample of the imported fill material or on-site materials to be re-used should be submitted to the geotechnical engineer for analysis and approval prior to use at least one week prior to

its use. The placement of all fill and backfill should be monitored by a qualified engineering technician to ensure that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests (methods ASTM D 6938 or ASTM D 1556) should be conducted on each lift to ensure that the specified compaction is achieved throughout the height of the fill or backfill.

5.4 GROUNDWATER CONTROL

Static groundwater was encountered during this investigation at depths deeper than anticipated footings and typical utility excavation depths. Therefore, based on anticipated final grades, static groundwater conditions are anticipated to be deeper than proposed site excavations. However, trapped/perched water may be expected to be encountered within the existing fill, at the existing fill natural soil interface, and/or within finer-grained layers of the natural site soils, especially following precipitation events. As such, construction phase dewatering of trapped/perched water through the use of gravity fed sump pumps should be anticipated during excavation activities for this site.

Because the subsurface soils will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations to rainfall. Overexcavation of saturated soils and replacement with controlled structural fill and/or one foot to two feet of open graded gravel (such as 3/4-inch clean crushed stone) may be required prior to resuming work on disturbed subgrade soils.

5.5 FOUNDATIONS

Shallow Foundation Design Criteria: Following overexcavation of existing fill, the results of the exploration indicate that the structures may be supported on conventional spread and continuous wall footings bearing on the underlying natural site soils and/or properly placed structural fill provided these materials are properly evaluated, placed, and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report. Foundations bearing within these materials may be designed to impart a maximum allowable net bearing pressure of 3,000 psf.

Reuse of the existing fill for foundation support will be contingent upon supplemental evaluation, as described in Section 5.11. All footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Regardless of loading conditions, proposed spread and continuous wall foundations should be sized no less than minimum dimensions of 36 inches and 24 inches, respectively.

Footings subject to overturning should be designed such that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift

loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. An allowable coefficient of friction against sliding of 0.35 is recommended for use in the design of the foundations bearing within the site materials.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils along and below the foundation bottoms be verified by a geotechnical engineer prior to placing concrete. In the event that areas of unsuitable materials are encountered, such as existing fill, overexcavation and replacement of the materials will be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be reduced if grade is restored with lean concrete. The bottom of overexcavations should be compacted with vibrating plates or plate tampers ("jumping jacks") to compact locally disturbed materials.

Settlement: Whitestone estimates post construction settlements of proposed building foundations to be less than one inch if the recommendations outlined in this report are properly implemented. Differential settlement of building foundations should be less than one-half inch.

Frost Coverage: Footings subject to frost action should be placed at least 42 inches below adjacent exterior grades or the depth required by local building codes to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the slab subgrade.

5.6 FLOOR SLABS

Following supplemental evaluation the existing fill, subgrade evaluation, and surficial compaction and proofrolling to densify upper relatively loose zones as described in this report, Whitestone anticipates that the site soils and/or approved imported structural fill materials to raise grades will provide suitable support for the proposed slab provided that these materials are inspected and prepared in accordance with Sections 5.2, 5.3, and 5.11 of this report. The suitability of existing fill for floor slab support will be contingent upon careful inspection and evaluation during construction phase. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic or contain objectionable materials, such as organics, should be removed and replaced with compacted structural fill. The properly prepared site materials and structural fill/backfill materials are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum four-inch layer of three-quarter inch crushed stone (AASHTO No. 57 stone or similar) should be installed below the floor slab to provide a uniform subgrade and capillary break. A moisture vapor barrier should be placed beneath the floor slab where recommended by the flooring or concrete finishing manufacturer.

5.7 PAVEMENT DESIGN CRITERIA

General: Following supplemental evaluation of existing fill as described in this report, Whitestone anticipates that improved and approved existing fill, the underlying natural soils, and/or compacted structural fill and/or backfill placed to raise or restore design elevations are expected to be suitable for support of the proposed pavements provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions.

Areas of overexcavation may be anticipated if the subgrades are exposed to precipitation. If the unimproved existing fill remain below proposed subgrades, increased maintenance, possibly including crack sealing, patching or more frequent re-paving, may be necessary. If the risk of increased maintenance is not acceptable, more extensive subgrade preparation recommendations can be developed. The following pavement section recommendations are based on the assumption that such an increased risk is acceptable. Whitestone would be pleased to prepare alternative recommendations for more substantial subgrade improvements.

Design Criteria: A California Bearing Ratio value of five has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18kip equivalent single axle loads (ESAL) for a 20-year life. An estimated maximum load of 25,000 ESAL was used for all pavement areas assuming the pavement primarily will accommodate both automobile and limited heavier truck traffic.

| FLEXIBLE PAVEMENT SECTION DESIGN | | | | |
|----------------------------------|-------------------------|--------------------|--|--|
| Layer | Material | Thickness (Inches) | | |
| Asphalt Surface | NYSDOT Type 7 or 7F top | 1.5 | | |
| Asphalt Base | NYSDOT Type 3 Binder | 2.5 | | |
| Granular Subbase | NYSDOT Type 2 Subbase | 6.0 | | |

Pavement Sections: The following recommended flexible pavement section is presented below:

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns (such as at access areas and trash enclosure pads). The recommended rigid pavement is presented below in tabular format:

| WHITESTONE |
|------------|
|------------|

| RIGID PAVEMENT SECTION | | | | |
|------------------------|----------------------------------|--------------------|--|--|
| Layer Material | | Thickness (Inches) | | |
| Surface | 4,000 psi air-entrained concrete | 5.0 ¹ | | |
| Base | NYSDOT Type 2 Subbase | 6.0 | | |

Note¹: The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches.

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, all subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with Sections 5.2, 5.3, and 5.11 of this report. Proper drainage must be provided for the pavement structure including appropriate grading and surface water control, radial drains at inlets, and interceptor drains throughout the site.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that NYSDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. All rigid concrete pavements should be suitably air-entrained, jointed, and reinforced.

5.8 RETAINING WALLS/LATERAL EARTH PRESSURES

General: The proposed redevelopment may include site retaining walls. While the design and investigation of the retaining structures are beyond Whitestone's current scope of work, Whitestone would be pleased to assist with the calculation of preliminary lateral earth pressures based on the soil parameters presented herein during the structural design phase when final grading and wall geometries are available.

Lateral Earth Pressure: Temporary retaining structures and permanent below-grade walls may be required to resist lateral earth pressures. Proposed below-grade walls must be capable of withstanding active and at-rest earth pressures. Below-grade walls free to rotate generally can be designed to resist active earth pressures. Below-grade walls corners and restrained walls need to be designed to resist at-rest earth pressures. Such structures should be properly designed by the Owner's engineer. The soil parameters in the following table apply to the encountered subsurface strata and may be used for design of the proposed temporary and permanent retaining structures.

Lateral earth pressure will depend on the backfill slope angle and the wall batter angle. A sloped backfill will add surcharge load and affect the angle of the resultant force. The effect of other surcharges will also

need to be included in earth pressure calculations, including the loads imposed by adjacent structures and traffic. The effects of proposed sloped backfill surface grades, and proposed slopes beyond the toe of the retaining structure, if applicable, must be considered when calculating resultant forces to be resisted by the retaining structure. A coefficient of friction of 0.35 against sliding can be used for concrete on the existing site soils. Below-grade wall footings should be designed so that the combined effect of vertical and horizontal resultants and overturning moment does not exceed the maximum soil bearing capacity provided in Section 5.5.

| LATERAL EARTH PRESSURE PARAMETERS | | | | |
|--|----------------------|----------------------------|--|--|
| Parameter | On-Site Soils | Imported Granular Backfill | | |
| Moist Density (y _{moist}) | 140 pcf | 140 pcf | | |
| Internal Friction Angle (q) | 28° | 30° | | |
| Active Earth Pressure Coefficient (K _a) | 0.36 | 0.33 | | |
| Passive Earth Pressure Coefficient (K _p) | 2.77 | 3.00 | | |
| At-Rest Earth Pressure Coefficient (K _o) | 0.53 | 0.50 | | |

Backfill Criteria: Whitestone recommends that granular soils be used to backfill behind the proposed below-grade walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. The majority of the site soils consisted of poorly graded sand (USCS: SP) with variable amounts of gravel that are anticipated to be suitable for below-grade wall backfill. The fine-grained site soils (USCS: ML) and granular site soils with an appreciable amount of fines (USCS: SM) may not be satisfactory for below-grade wall backfill unless approved by the wall designer. Accordingly, imported granular soils may be required. A maximum density of 140 pcf should not be exceeded to avoid creating excessive lateral pressure on the walls during compaction operations.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

Wall Drainage: Positive gravity drainage of the backfill should be provided at the base of the below-grade walls by a series of perforated pipes surrounded by at least 18 inches of clean crushed stone that discharges into a stormwater sewer or daylights to appropriate site surface drainage. Whitestone recommends that a two-foot wide zone of clean crushed stone or washed sand, separated from the backfill by a filter fabric, be constructed adjacent to the back of the wall. This zone should prevent the buildup of hydrostatic pressures and pressures from freezing moisture in the backfill above the groundwater level. The vertical drain should be tied into the gravity drainage system (perforated pipe) installed at the base of the wall. Alternatively,

below-grade walls may include weep holes instead of a drain tied to the site drainage system. Where wall drainage is not provided, the wall should be designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

5.9 SEISMIC AND LIQUEFACTION CONSIDERATIONS

The soils encountered during this investigation are most consistent with a Site Class D defined by the *New York State International Building Code (2020).* Based on the seismic zone and soil profile, liquefaction considerations are not expected to have a substantial impact on design.

5.10 EXCAVATIONS

The soils encountered during this investigation within anticipated excavation depths are consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA) to ensure that safe excavation methods and/or shoring and bracing requirements are implemented.

5.11 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Phase Evaluation of Existing Fill: Contingent upon construction phase evaluation of the existing fill and overexcavation of unsuitable portions, Whitestone preliminarily anticipates that the majority of the existing fill will be suitable for floor slab and pavement support with some anticipated overexcavation, due to the inherent variability that exists within existing fill. Whitestone also anticipates that the majority of the existing fill will be suitable for selective reuse as structural fill following segregation of oversized and/or deleterious/objectionable debris and following careful inspection in the field by the owner's geotechnical engineer during construction. Due to the inherent variability that exists within existing fill, Whitestone recommends confirming further the condition of the existing fill for floor slab and pavement support and/or reuse as structural fill by means of supplemental evaluation either prior to or during the early stages of construction, as discussed further herein, to identify areas requiring removal and possible uncontrolled conditions or deleterious materials not disclosed by the subsurface tests conducted during this exploration.

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to verify that the existing structures are properly demolished, any encountered underground

structures are properly backfilled, the existing surface cover materials are properly removed, and suitable materials used for controlled fill are properly placed and compacted over suitable subgrade soils. The overexcavation of unsuitable materials, where required, and proofrolling of subgrades prior to structural support should be witnessed and documented by the owner's geotechnical engineer.

Grading and Site Plan Review: Whitestone recommends that this report be reviewed in its entirety once grading and site plans are finalized to evaluate any impacts to the recommendations as a result of any proposed alterations.

SECTION 6.0 General Comments

Supplemental recommendations may be required upon finalization of construction plans or if significant changes are made in the characteristics or location of the proposed structures. Soil bearing conditions should be checked at the appropriate time for consistency with those conditions encountered during Whitestone's geotechnical investigation.

The possibility exists that conditions between borings may differ from those at specific boring locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may alter soil and rock conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered.

The recommendations presented herein should be utilized by a qualified engineer in preparing the project plans and specifications. The engineer should consider these recommendations as minimum physical standards which may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the sole use of Thiells Roseville Fire Department for the specific project detailed and should not be used by any third party. These recommendations are relevant to the design phase and should not be substituted for construction specifications.

Whitestone assumes that a qualified contractor will be employed to conduct the construction work, and that the contractor will be required to exercise care to ensure all excavations are conducted in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability.

Whitestone recommends that the services of the geotechnical engineer be engaged to test and evaluate the soils in the footing excavations prior to concreting in order to determine that the soils will support the bearing capacities. Monitoring and testing also should be conducted to verify that suitable materials are used for controlled fills and that they are properly placed and compacted over suitable subgrade soils.

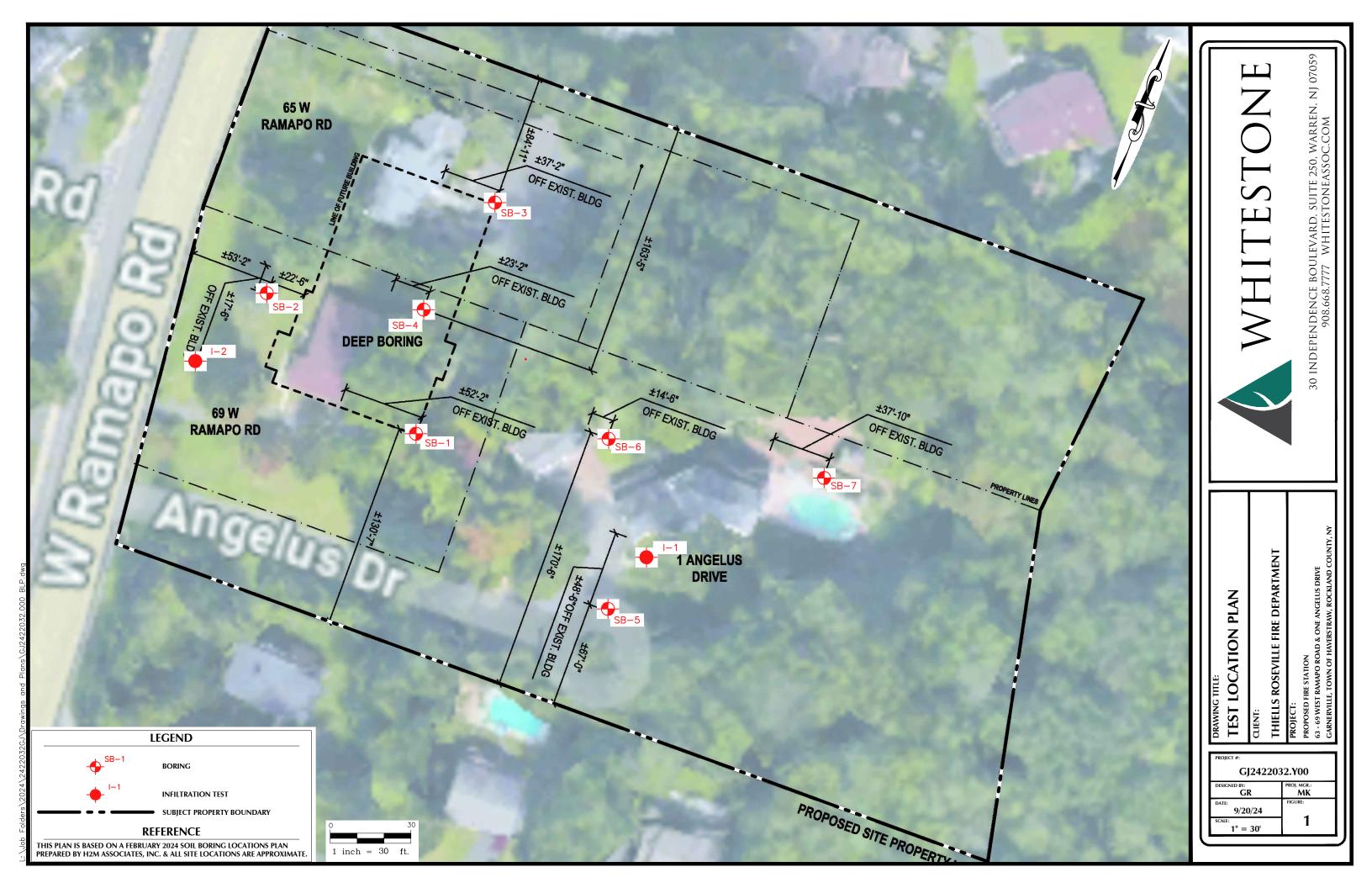
The exploration and analysis of the foundation conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted for the proposed construction are based on the available soil information and the preliminary design details furnished by H2M Architects & Engineers. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of the geotechnical engineer.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

WHITESTONE



FIGURE 1 Test Location Plan





APPENDIX A Records of Subsurface Exploration



Boring No.: SB-1

| Project: | | Propo | osed Fire Station | | | | | | | | WAI Project No.: | GJ2422032.Y00 | |
|-----------------|----------|-------------------|------------------------------------|---------------|--------|-----------|---------------------|-------------------------|---------------------------------|------------------------|-----------------------------|-------------------|--|
| Location: | | 63 – | 69 West Ramapo Ro | bad & | One An | gelus Dri | /e; Garnerville | , Town o | of Haverstraw, R | ockland County, N | IY Client: | Thiells Roseville | Fire Department |
| Surface El | levatio | n: | ± 406.0 fee | t | | | Date Started: | - | 9/3/2024 | | er Depth Elevation | Cave-Ir | n Depth Elevation |
| Terminatio | on Dep | oth: | 25.8 fee | t bgs | | | Date Complet | ed: | 9/3/2024 | (fe | eet bgs) (feet) | (fe | et bgs) (feet) |
| Proposed | Locat | ion: | Building | | | | Logged By: | RN | | During: | 12.0 394.0 🕎 | | |
| Drill / Test | Methe | od: | HSA / SPT | | | | Contractor: | GB | | At Completion: | <u> 12.0 394.0 </u> | At Completion: | 10.0 396.0 |
| | | | | | | | Equipment: | Diedri | ch D50 | 24 Hours: | <u></u> | 24 Hours: | I 🔟 |
| | | | | | | | | | | - | | | |
| | 5A | | E INFORMATION | | | DEPTH | STRAT | ГА | | DESCRIPTIO | N OF MATERIALS | ; | REMARKS |
| Depth (feet) | No | Туре | Blows Per 6" | Rec. (in.) | N | (feet) | | | | (Clas | sification) | | |
| | | | | | | 0.0 | TODOOU | \$112 | 40 T 11 | | | | |
| | | | | | | 0.3 | TOPSOIL FILL | $\overline{\mathbf{x}}$ | 4" Topsoil Brown Sandy Silt, | Moist (FILL) | | | 4 |
| 0 - 2 | S-1 | IV | 2 - 2 - 4 - 3 | 12 | 6 | _ | | | | | | | |
| 0-2 | 0-1 | $ \Lambda $ | 2 - 2 - 4 - 5 | 12 | Ů | | | | | | | | |
| | | $\langle \rangle$ | | | | 2.0 | | \times | | | | | |
| | | Ν/ | | | | - | GLACIAL DEPOSITS | | | | | | |
| 2 - 4 | S-2 | IV. | 4 - 6 - 11 - 12 | 14 | 17 | | DEFOSITS | | Brown Poorly Gra | ded Sand, Little Grav | vel, Moist, Medium Dense | (SP) | |
| | | $ \Lambda $ | | | | - | 1 | | - | | | | |
| | | () | | | | - 1 | 4 | | | | | | ł |
| | | Λ / | | | | 5.0 | 4 | | | | | | |
| 4 - 6 | S-3 | X I | 12 - 20 - 27 - 21 | 12 | 47 | 5.0 | 4 | | Brown Poorly Gra | ded Gravel with Silt a | and Sand, Moist, Dense (| GP-GM) | |
| | | $ / \rangle$ | | | | . | ┫ | | | | | | |
| | | (\rightarrow) | | | | - 1 | 4 | | | | | | ł |
| | | NZ | | | | - | - | | | | | | |
| 6 - 8 | S-4 | IX | 17 - 16 - 13 - 14 | 10 | 29 | | - | | Brown Poorly Gra | ded Sand, Trace Silt | , Moist, Medium Dense (S | P) | |
| | | $V \setminus$ | | | | - | | | | | | | |
| | | | | | | 1 - | | | | | | | |
| | | \mathbb{N} | | | | - | | | | | | | |
| 8 - 10 | S-5 | ١Å | 6 - 8 - 11 - 10 | 7 | 19 | _ | | | As Above, Little G | ravel (SP) | | | |
| | | $V \setminus$ | | | | 10.0 | <u>a</u> | | | | | | |
| | | | | | | 1 - | Ī | | | | | | |
| 10 - 12 | S-6 | IV | 6 - 5 - 5 - 4 | 20 | 10 | |] | | As Above (SP) | | | | |
| 10-12 | 3-0 | $ \Lambda $ | 0 - 3 - 3 - 4 | 20 | 10 | |] | | AS ADOVE (SF) | | | | |
| | | \checkmark | | | | ∇ | ¥ | | | | | | |
| | | | | | | | | | | | | | Water @ 12.0 fbgs Tip of Spoon |
| | | | | | | | 1 | | | | | | |
| | | | | | | - | | | | | | | |
| | | | | | | | - | | | | | | |
| | | | | | | 15.0 | 4 | | | | | | |
| | | | | | | 10.0 | 1 | | | | | | |
| | | \mathbb{N} | | | | • | 1 | | | | | | |
| 15 - 17 | S-7 | IX I | 7 - 20 - 18 - 15 | 19 | 38 | | 1 | | Brown Poorly Gra | ded Sand with Grave | el, Trace Silt, Wet, Dense | (SP) | |
| | | $V \setminus$ | | | | • | 1 | | | | | | |
| | i – | ſ ' | | | | 1 - | 1 | | | | | | |
| | | | | | | • | 1 | | | | | | |
| | | | | | | | 1 | | | | | | |
| | | ĺ | | | | ' |] | | | | | | |
| | | | | | | |] | | | | | | |
| | | | | | | 20.0 | 1 | | | | | | |
| | | Λ / | 1 | | | . | 1 | | | | | | |
| 20 - 21.8 | S-8 | ١V | 7 - 15 - 29 - ^{50/} 3" | 14 | 44 | | 4 | | Brown Poorly Gra | ded Sand, Little Grav | vel, Trace Silt, Wet, Dens | e (SP) | |
| | | $ \Lambda $ | 3" | | | . | 4 | | , 5.4 | ., | | . , | |
| | | λ | | | L | ┥ _ | 4 | | | | | | Davide Defili |
| | | | | | | . | 4 | | | | | | Rough Drilling 22.0 fbgs to 25.0 fbgs |
| | | | | | | | 4 | | | | | | |
| | | | | | | . | 4 | | | | | | |
| | | | | | | | 4 | | | | | | |
| | | | | | | 25.0 | 4 | | | | | | |
| | | | | | | 25.0 | 4 | | | | | | ł |
| | | | | | | | | | | | | | |



Boring No.: SB-1

Page 2 of 2

| Project: | | | sed Fire Stat | | | | | | | | | WAI Project No.: | GJ2422032.Y00 | |
|-----------------|--------|--------------|---------------|-------|---------------|---------|--------|---------------------|---------|----------------------|-------------------------|-------------------------|-------------------|------------------------|
| Location: | | 63 – 6 | | | | One Ang | | | | | ockland County, N | | Thiells Roseville | |
| Surface El | | | ± 406.0 | | | | | Date Started: | - | 9/3/2024 | | r Depth Elevation | | n Depth Elevation |
| Terminatio | | | 25.8 | | bgs | | | Date Complet | ed: | 9/3/2024 | (fe | et bgs) (feet) | (fe | eet bgs) (feet) |
| Proposed | Locati | on: | Building | g | | | | Logged By: | RN | | During: | 12.0 394.0 🝸 | | |
| Drill / Test | Metho | od: | HSA / S | SPT | | | | Contractor: | GB | | At Completion: | 12.0 394.0 🗸 | At Completion: | 10.0 <u>3</u> 96.0 💆 |
| | | | | | | | | Equipment: | Diedric | h D50 | 24 Hours: | <u> </u> | 24 Hours: | I 💆 |
| | S A | MDU | | | | | D | | | | l | | <u> </u> | |
| Denth | 34 | ME EI | | | Ber I | | DEPTH | STRA1 | A | | DESCRIPTIO | N OF MATERIALS | | REMARKS |
| Depth (feet) | No | Туре | Blows Pe | | Rec. (in.) | N | (feet) | | | | | sification) | | |
| | | | | | | | 25.0 | | | | | | | |
| 25 - 25.8 | S-9 | \mathbf{X} | 43 - | 50/3" | 10 | 50/3" | | GLACIAL DEPOSITS | | Brown Silt, Little (| Gravel, Little Clay, We | et, Hard (ML) | | Qu = 4.5 tsf |
| | | | | | | | 25.8 | DEPOSITS | 1 | | | of 25.8 Feet Below Grou | und Surface | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | _ | 4 | | | | | | |
| | | | | | | | 30.0 | 1 | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | |] | | | | | | |
| | | | | | | | _ | 1 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | - | 4 | | | | | | |
| | | | | | | | 35.0 | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | - | 1 | | | | | | |
| | | | | | | | |] | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | _ | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | 40.0 | 4 | | | | | | |
| | | | | | | | 40.0 | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | - | 1 | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | _ |] | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | 45.0 | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | | 4 | | | | | | |
| | | | | | | | - | 1 | | | | | | |
| | | | | | | | | 1 | | | | | | |
| | | | | | | | - | 1 | | | | | | |
| | | | | | | | |] | | | | | | |
| | | | | | | | |] | | | | | | |
| | | | | | | | 50.0 | 1 | | | | | | |
| | | | | | | | | | | | | | | |
| I | | · · · · · | | | | | | 1 | | | | | | • • • • • • |



Boring No.: SB-2

| Project: | | Prop | osed Fire Station | | | | | | | | WALPr | ject No.: | GJ2422032.Y00 | |
|--------------|----------|----------------|-----------------------|-------|---------|---------------|-----------------|---------|------------------|---|----------------|--------------|-------------------|-------------------|
| Location: | | | 69 West Ramapo Ro | % had | One An | aelus Driv | /e: Garnerville | Town | of Haverstraw F | Rockland County | | Client: | Thiells Roseville | Fire Department |
| Surface El | levatio | | ± 404.0 fee | | ono / u | | Date Started: | | 9/3/2024 | 1 | er Depth | | 1 | Depth Elevation |
| Terminatio | | | | t bgs | | | Date Complet | - | 9/3/2024 | | feet bgs) | | | eet bgs) (feet) |
| Proposed | - | | SMP / Building | | | | Logged By: | RN - | 0,0,2021 | During: | NE | | (10 | |
| Drill / Test | | | HSA / SPT | 1 | | | Contractor: | GB | | At Completion: | | ÷ | At Completion: | DNC 🖾 |
| | moun | Ju. | | | | | Equipment: | Diedrie | ch D50 | 24 Hours: | | ¥ | 24 Hours: | |
| | | | | | | | - 1 | | | | ' | ¥ | | ' \ |
| | SA | MPL | E INFORMATION | l | | DEPTH | | - • | | DECODIDEN | | | | DEMARKO |
| Depth | N | F | Diama Dan All | Rec. | | ((| STRAT | A | | DESCRIPTIO | ssificatio | | | REMARKS |
| (feet) | No | Туре | Blows Per 6" | (in.) | N | (feet) 0.0 | | 1 | | (Cia | SSIIICatio | | | |
| | | | | | | 0.5 | TOPSOIL | NU/ | 6" Topsoil | | | | | • |
| | | V | | | | - | FILL | 225 | Brown Sandy Silt | , Moist (FILL) | | | | |
| 0 - 2 | S-1 | ΙÅ | 1 - 2 - 2 - 3 | 18 | 4 | | 1 | | | | | | | |
| | | / | | | | |] | | | | | | | |
| | | Ν/ | | | | - | | | As Above (FILL) | | | | | |
| 2 - 4 | S-2 | Υ | 3 - 3 - 4 - 4 | 20 | 7 | 2.8 | 4 | | | aded Sand, Moist (Fl | LL) | | | |
| | | $ \rangle$ | | | | - | 4 | | | | | | | |
| | — | \mapsto | | | | 1 - | ┫ | | | | | | | |
| | | $\backslash /$ | | | | 5.0 | 4 | | | | | | | |
| 4 - 6 | S-3 | X | 2 - 3 - 2 - 3 | 12 | 5 | | 1 | | As Above (FILL) | | | | | |
| | | $/ \setminus$ | | | | 6.0 | 1 | | | | | | | |
| | | | | | | 1 - | GLACIAL | | | | | | | † I |
| 6 - 8 | S-4 | V | 2 - 4 - 8 - 11 | 18 | 12 | _ | DEPOSITS | | Brown Silty Sand | with Gravel, Moist, M | Medium Deng | e (SM) | | |
| 0 - 0 | | $ \Lambda $ | - - 0 - 11 | 10 | 12 | _ | 1 | | Signa Giny Gallu | Graver, Morst, P | | | | |
| L | | \square | | | | _ | 4 | | | | _ | | | |
| 8 - 8.4 | S-5 | X | 50/5" | NR | 50/5" | 8.5 | | | | sumed As Above, Ve Terminated at a Dep | | - | nd Surface Due to | Rough Drilling |
| | | | | | | | 4 | | Auger Refusal | reminated at a Dep | oth of 8.5 Fee | t Below Grou | nd Surrace Due to | |
| | | | | | | 10.0 | 4 | | - | | | | | |
| | | | | | | 10.0 | - | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | _ |] | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | 15.0 | 4 | | | | | | | |
| | | | | | | 15.0 | 4 | | | | | | | |
| | | | | | | - | | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | ' | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | _ |] | | | | | | | |
| | | | | | | . | 1 | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | 20.0 | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | _ |] | | | | | | | |
| | | | | | | _ | 1 | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| 1 | | | | | | 25.0 | 4 | | | | | | | |
| | | | | | | | | | | | | | | |
| | - | | | - | | - | | - | | | | | | |



Boring No.: SB-3

| Project: | | Prop | osed Fire Station | | | | | | | | WAI Project No .: | GJ2422032.Y00 | |
|-----------------|---------|-------------------|-------------------|---------------|--------|--------------|---------------------|--------------|----------------------|-----------------------|-------------------------------|--------------------|--|
| Location: | | 63 – | 69 West Ramapo Ro | oad & | One An | igelus Dri | ve; Garnerville, 1 | Fown o | of Haverstraw, R | ockland County, N | Y Client: | Thiells Roseville | Fire Department |
| Surface E | levatio | on: | ± 400.0 fee | t | | | Date Started: | _ | 9/3/2024 | | r Depth Elevation | Cave-Ir | Depth Elevation |
| Terminati | on Dep | oth: | 12.0 fee | t bgs | | | Date Completed | d: _ | 9/3/2024 | (fe | eet bgs) (feet) | (fe | et bgs) (feet) |
| Proposed | Locat | ion: | Building | | | | Logged By: | RN | | During: | 8.0 392.0 🕎 | | |
| Drill / Tes | t Meth | od: | HSA / SPT | | | | - | GB | | At Completion: | 8.0 392.0 🗸 | At Completion: | 8.0 392.0 💆 |
| | | | | | | | Equipment: | Diedrie | ch D50 | 24 Hours: | _ | 24 Hours: | <u> </u> |
| | SA | MPL | E INFORMATION | I | | DEPTH | 4 | | | <u>.</u> | | | |
| Depth (feet) | No | Туре | Blows Per 6" | Rec. (in.) | N | (feet) | STRATA | 7 | | | N OF MATERIALS sification) | | REMARKS |
| (ieet) | | Type | BIOWS FEI 0 | () | N | 0.0 | | | | | Sincationy | | |
| | | | | | | 0.3 | PAVEMENT FILL | | 3" Asphalt, No Ap | parent Subbase | | | |
| | | | | | | | | 88 | | | | | |
| | | N/ | | | | | 4 | XX. | Brown Silty Sand | Some Gravel, Moist | (EUL) | | |
| 1 - 3 | S-1 | IX | 1 - 4 - 3 - 3 | 4 | 7 | _ | 4 | ××. | Brown Silty Salid, | Some Gravel, Moist | | | |
| | | $ /\rangle$ | | | | | 4 | ××. | | | | | |
| | | $\left(\right)$ | | | | - 1 | - | 888. | | | | | |
| | | IV | | | | · · | 1 | 888. | | | | | |
| 3 - 5 | S-2 | ١Å | 2 - 3 - 4 - 12 | 8 | 7 | | 1 | 888. | As Above (FILL) | | | | |
| | | $\langle \rangle$ | | | | 5.0 | | <u> </u> | | | | | |
| | 1 | N7 | | | | | GLACIAL DEPOSITS | :::: | | | | | |
| 5 - 7 | S-3 | X | 23 - 22 - 22 - 20 | 6 | 44 | - | | | Brown Poorly Gra | ded Sand, Some Gra | vel, Trace Silt, Moist, Der | nse (SP) | |
| | | $ /\rangle$ | | | | 7.0 | 4 | | | | | | |
| | | $\left(\right)$ | | | | 7.0 | - | | | | | | |
| | | IV | | | | 騒入 | 4 | | | | | | Qu = 3.0 tsf |
| 7 - 9 | S-4 | ١Ň | 17 - 10 - 8 - 9 | 12 | 18 | | Ť | | Brown Silt, Little S | Sand, Moist to Wet, V | ery Stiff (ML) | | Water @ 8.0 fbgs |
| | | $\langle \rangle$ | | | | 9.0 |] [| | | | | | |
| | | Ν/ | | | | | | <u>7</u> | | | | | |
| 9 - 11 | S-5 | IX | 9 - 9 - 21 - 23 | 3 | 30 | 10.0 | 4 | 0;;{0°,0;;0% | Brown Poorly Gra | ded Gravel with Sand | d, Trace Silt, Wet, Dense | (GP) | Rough Drilling 10.0 fbgs to 12.0 fbgs |
| | | $ /\rangle$ | | | | . | 4 | Å | | | | | 10.0 1095 10 12.0 1095 |
| | | <u> </u> | | | | - 1 | - | ç | | | | | |
| | | | | | | 12.0 | 1 | 00 | | | | | |
| | | | | | | | | | | Ferminated at a Dept | h of 12.0 Feet Below Grou | und Surface Due to | |
| | | | | | | I _ | 4 | | Auger Refusal | | | | |
| | | | | | | | 4 | | | | | | |
| | | | | | | - 1 | 4 | | | | | | |
| | | | | | | 15.0 | - | | | | | | |
| | 1 | | | | | - | 1 1 | | | | | | |
| l. | | | | | | ['] | 1 1 | | | | | | |
| l. | | | | | | | | | | | | | |
| l. | 1 | | | | | _ | .↓ | | | | | | |
| l. | 1 | | | | | , | 4 | | | | | | |
| | | | | | | - | 4 | | | | | | |
| l. | 1 | | | | | · · | - | | | | | | |
| | 1 | | | | | - | 1 | | | | | | |
| | 1 | | | | | 20.0 | 1 | | | | | | |
| | | | | | | _ |] | | | | | | |
| | | | | | | _ | 4 | | | | | | |
| | 1 | | | | | . | 4 | | | | | | |
| | 1 | | | | | - | 4 | | | | | | |
| | 1 | | | | | · · | - | | | | | | |
| | | | | | | - | 1 | | | | | | |
| I | 1 | | | | | | <u>1</u> | | | | | | |
| | 1 | | | | | | | | | | | | |
| | 1 | | | | | 25.0 | 4 | | | | | | |
| | | | | | | | | | | | | | |



Boring No.: SB-4

| Breisst | | Dec - | and Fire Station | | | | | | | | WALD-SEAL | C 12400000 Vcc | |
|-----------------------|--------|-------------------|--|-------|----------|------------|---------------------|----------------|--------------------------------|---------------------|--------------------------------|----------------|---------------------------|
| Project: Location: | | | osed Fire Station 69 West Ramapo Ro | ad 8 | One An | aolus Dri | ve: Garponville | Town | of Haverstrow | | WAI Project No.: VY Client: | | Fire Department |
| Surface El | evatio | | \pm 404.0 feet | | | | Date Started: | | 9/4/2024 | | er Depth Elevation | | n Depth Elevation |
| Terminatio | | | | t bgs | | | Date Complet | - | 9/4/2024 | | feet bgs) (feet) | | eet bgs) (feet) |
| Proposed | | | Building | t bys | | | Logged By: | RN | 514/2024 | During: | 11.0 393.0 | | |
| Drill / Test | | | HSA / SPT | | | | Contractor: | GB | | At Completion: | | | 🔀 |
| 21117 1030 | mean | <i>.</i> | | | | | Equipment: | | ch D50 | 24 Hours: | | | i ii |
| | | | | | | _ | Equipment. | Dicun | | 24 110013. | | 24110013. | [_] [\] |
| | SA | MPL | E INFORMATION | l | | DEPTI | - | | | DEGODIDE | | • | |
| Depth | Na | Turne | Blowe Ber 6" | Rec. | N | (feet) | STRA | IA | | | ON OF MATERIAl ssification) | -3 | REMARKS |
| (feet) | No | Туре | Blows Per 6" | (in.) | N | 0.0 | | | | (010 | somoutiony | | |
| | | 7 | | | | 0.3 | TOPSOIL | <u><u></u></u> | 3" Topsoil Brown Sandy Silt | Maint (FUL) | | | 4 |
| | | IV | | | | | FILL | | Brown Sandy Sill, | MOIST (FILL) | | | |
| 0 - 2 | S-1 | ΙÅ | 1 - 2 - 2 - 2 | 2 | 4 | | | | | | | | |
| | | \lor | | | | | | | | | | | |
| | | Ν / | | | | | | | | | | | |
| 2 - 4 | S-2 | IV | 1 - 1 - 1 - 1 | 5 | 2 | _ | | | As Above (FILL) | | | | |
| | | $ \Lambda $ | | - | _ | | | | | | | | |
| L | | () | | | | 4.0 | 0146111 | | | | | | 4 |
| | | Λ / | | | | F ^ | GLACIAL DEPOSITS | | | | | | |
| 4 - 6 | S-3 | IX | 2 - 3 - 16 - 19 | 10 | 19 | 5.0 | | | Brown Poorly Gra | ded Sand, Some Gra | avel, Moist, Medium De | nse (SP) | |
| | | $ /\rangle$ | | | | | 4 | | | | | | |
| <u> </u> | | (\rightarrow) | | | | - | - | | | | | | |
| | | NZ | | | | | - | | | | | | |
| 6 - 8 | S-4 | IX I | 16 - 21 - 16 - 15 | 18 | 37 | - | | | As Above, Little G | Gravel, Dense (SP) | | | |
| | | $V \setminus$ | | | | | - | | | | | | |
| | | $ \rightarrow $ | | | | - 1 | | | | | | | |
| | | \mathbb{N} | | | | | _ | | | | | | |
| 8 - 10 | S-5 | ١X | 10 - 11 - 9 - 9 | 21 | 20 | _ | | | As Above, No Gra | avel, Medium Dense | (SP) | | |
| | | $V \setminus$ | | | | 10.0 | | | | | | | |
| | | | | | | 1 - | | | | | | | |
| 10 - 12 | S-6 | IV | 4 - 4 - 3 - 3 | 18 | 7 | ∇ | $\bar{\Lambda}$ | | As Above Moist t | o Wet, Loose (SP) | | | Water @ 11.0 fbgs |
| 10 - 12 | 0-0 | $ \Lambda $ | | 10 | ' | | | | | 0 Wel, 20036 (01) | | | Water @ 11.0 lbg3 |
| | | \checkmark | | | | - | _ | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | _ | _ | | | | | | |
| | | | | | | | _ | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | 15.0 | 4 | | | | | | |
| | | | | | | | | 14131 | | | | | 1 |
| | | \mathbb{N} | | | | | 1 | | | | | | |
| 15 - 17 | S-7 | ١X | 14 - 15 - 15 - 23 | 14 | 30 | - | 1 | | Brown Silty Sand | Trace Clay, Wet (Sl | M) | | |
| | | $V \setminus$ | | | | | 1 | | | | | | |
| | | | | | | 1 - | | | | | | | |
| | | | | | | _ | | | | | | | |
| | | | | | | - | | | | | | | |
| | | | | | | _ | | | | | | | |
| | | | | | | | | | | | | | |
| | L | <u> </u> | | | | 20.0 | 4 | | | | | | |
| | | ΝZ | | | | | 4 | | | | | | |
| 20 - 22 | S-8 | X | 47 - 12 - 13 - 13 | 18 | 25 | - | - | | As Above, Some | Gravel, Medium Den | ise (SM) | | |
| | | $ / \rangle$ | | | | | - | | | | | | |
| | | r \ | | | | - | - | | | | | | |
| | | | | | | | 4 | | | | | | |
| | | | | | | - | - | | | | | | |
| | | | | | | | - | | | | | | |
| | | | | | | - | | | | | | | |
| | | | | | | 25.0 | 1 | | | | | | |
| | | | | | | - | | | | | | | |
| | | ļ | ļ | | <u> </u> | I | | 14441 | 1 | | | | |



Boring No.: SB-4

Page 2 of 2

| Proje | ct: | | Propo | sed Fire Station | | | | | | | | WAI Project No.: | GJ2422032.Y00 | |
|----------|--------|--------|----------------------------|------------------|--------|--------|----------------|-----------------|---------|--------------------|---------------------|----------------------------|--------------------|--------------------------|
| Locat | ion: | | 63 – 6 | 69 West Ramapo R | oad & | One Ar | igelus Driv | e; Garnerville, | Town o | of Haverstraw, R | ockland County, I | NY Client: | Thiells Roseville | Fire Department |
| Surfa | ce Ele | evatio | n: | ± 404.0 fee | et | | 1 | Date Started: | | 9/4/2024 | Wat | er Depth Elevation | Cave-I | n Depth Elevation |
| Termi | natio | n Dep | th: | 31.0 fee | et bgs | | | Date Complete | ed: | 9/4/2024 | (| feet bgs) (feet) | (fe | eet bgs) (feet) |
| Propo | sed I | Locati | ion: | Building | | | | _ogged By: | RN | | During: | 11.0 393.0 🍸 | | |
| Drill / | Test | Metho | od: | HSA / SPT | | | | Contractor: | GB | | At Completion: | 11.0 393.0 🖓 | At Completion: | <u> </u> <u>\</u> |
| | | | | | | | | Equipment: | Diedrie | ch D50 | 24 Hours: | <u> </u> | 24 Hours: | I 🔟 |
| | | SA | MPLE | | 1 | | DEPTH | | | | 1 | | 1 | |
| Dep | | | | | Rec. | | | STRAT | A | | | ON OF MATERIALS | 6 | REMARKS |
| (fee | et) | No | Туре | Blows Per 6" | (in.) | N | (feet) 25.0 | | 14414 | | (Cia | ssification) | | |
| 25 - 2 | 25.3 | S-9 | $\overline{}$ | 50/4" | 4 | 50/4" | 20.0 | GLACIAL | | Gray Silty Sand, S | Some Gravel, Trace | Clay, Wet, Very Dense (S | M) | |
| 20 2 | .0.0 | 00 | \sim | | - | 00/- | - 1 | DEPOSITS | | | | | , | Rough Drilling 25.5 fbgs |
| | | | | | | | | | | | | | | to 30.0 fbgs |
| | | | | | | | - | Ì | | | | | | |
| | | | | | | | _ | I | | | | | | |
| | | | | | | | L _ | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | 1 | | - | ł | | | | | | |
| | | | | | | | 30.0 | ł | | | | | | |
| 30 - 30 | .3 | S-10 | $\mathbf{\mathbf{\nabla}}$ | 50/4" | 4 | 50/4" | 1 | ł | | As Above (SM) | | | | |
| <u> </u> | - | | $ \rightarrow $ | | | 1 | 31.0 | t | | (, | | | | |
| | | | | | 1 | Ī | _ | | | Boring Log SB-4 | Terminated at a Dep | oth of 31.0 Feet Below Gro | und Surface Due to | 1 |
| | | | | | | | _ | ļ | | Auger Refusal | | | | |
| | | | | | | | - | | | | | | | |
| | | | | | | | _ | ł | | | | | | |
| | | | | | | | - | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | 35.0 | | | | | | | |
| | | | | | | | - | | | | | | | |
| | | | | | | | _ | Ī | | | | | | |
| | | | | | | | _ | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | - | • | | | | | | |
| | | | | | | | | • | | | | | | |
| | | | | | | | - | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | 40.0 | | | | | | | |
| | | | | | | | | I | | | | | | |
| | | | | | | | _ | ļ | | | | | | |
| | | | | | | | - | ļ | | | | | | |
| | | | | | | | — | ł | | | | | | |
| | | | | | 1 | | - | ł | | | | | | |
| | | | | | 1 | | - | t | | | | | | |
| | | | | | 1 | | - | İ | | | | | | |
| | | | | | | | - | İ | | | | | | |
| | | | | | | | 45.0 | Į | | | | | | |
| | | | | | | | - | ļ | | | | | | |
| | | | | | | | - | ł | | | | | | |
| | | | | | 1 | | - | ł | | | | | | |
| | | | | | 1 | | - | ł | | | | | | |
| | | | | | 1 | | | t | | | | | | |
| | | | | | | | - | t | | | | | | |
| | | | | | 1 | | - | İ | | | | | | |
| | | | | | 1 | | | Ι | | | | | | |
| | | | | | 1 | | 50.0 | ļ | | | | | | |
| L | | | | | | | | | | | | | | |



Boring No.: SB-5

| Project: | | Propo | osed Fire Station | | | | | WAI Project No.: GJ2422032.Y00 | |
|--------------|----------|-------------------|-------------------|-------|--------|---------------|-----------------------|---|------------------------------|
| Location: | | 63 – 6 | 69 West Ramapo Ro | bad & | One An | gelus Dri | ve; Garnerville, Town | f Haverstraw, Rockland County, NY Client: Thiells Roseville | Fire Department |
| Surface El | | | ± 404.0 feet | | | | Date Started: | | n Depth Elevation |
| Terminatio | - | | | t bgs | | | Date Completed: | | eet bgs) (feet) |
| Proposed | | | Pavement/SW | /M | | | Logged By: RN | During: <u>13.0 391.0</u> | |
| Drill / Test | Metho | od: | HSA / SPT | | | | Contractor: GB | At Completion: <u>12.0</u> <u>392.0</u> ♀ At Completion: | <u>13.0 391.0</u> |
| | | | | | | | Equipment: Diedr | h D50 24 Hours: 24 Hours: 24 Hours: | <u> </u> |
| | SA | MPL | E INFORMATION | I | | DEPTH | 4 | | |
| Depth | Na | Turne | Blowe Box C" | Rec. | N | | STRATA | DESCRIPTION OF MATERIALS (Classification) | REMARKS |
| (feet) | No | Туре | Blows Per 6" | (in.) | N | (feet) 0.0 | | | |
| | | | | | | 0.3 | FILL | 3" Asphalt, No Apparent Subbase | 4 |
| | | | | | | |] '''' & | | |
| | | N/ | | | | |] 8 | | |
| 1 - 3 | S-1 | ΙX | 1 - 2 - 2 - 3 | 12 | 4 | | ↓ ⊗ | Brownish-Yellow Silt, Trace Sand, Moist (FILL) | |
| | | $ \land $ | | | | | - 188 | | |
| | | () | | | | 3.0 | GLACIAL | | 4 |
| | | $ \backslash / $ | | | | · | DEPOSITS | | |
| 3 - 5 | S-2 | ΙXΙ | 6 - 15 - 17 - 22 | 20 | 32 | - | † ∎∷∷i | Brown Poorly Graded Sand, Little Gravel, Moist, Dense (SP) | |
| | | VΝ | | | | 5.0 | 1 I I I I | | |
| | | | | | | 1 . |] [| | |
| 5 - 7 | S-3 | ΙV | 8 - 14 - 15 - 16 | 14 | 29 | | ↓ ∎∷ | As Above, No Gravel, Medium Dense (SP) | |
| | | $ \Lambda $ | | | | . | ↓ ∷ | | |
| | | () | | | | | | | 4 |
| | | Λ / | | | | · · | | | |
| 7 - 9 | S-4 | X | 13 - 14 - 20 - 28 | 16 | 34 | - | | Brown Silty Sand with Gravel, Dense (SM) | |
| | | V V | | | | | | | |
| | | | | | | 1 - | | | |
| | | | | | | 10.0 | | | |
| 10 - 10.9 | S-5 | \mathbb{N} | 21 - 50/5" | 1 | 50/5" | | | | Cobble Piece in |
| | | \sim | | | | | | Brown Poorly Graded Sand, Little Gravel, Moist, Very Dense (SP) | Spoon Shoe Rough Drilling |
| | | | | | | | 4 | | 11.0 fbgs to 13.0 fbgs; |
| | | | | | | | Ť | | Boulder Likely |
| | | | | | | | 4 | | |
| | | | | | | _ | 1 | | Water @ ~13.0 fbgs |
| | | | | | | |]] | | |
| | | | | | | | ↓ :::: | | |
| | <u> </u> | | | | | 15.0 | ┨ ┃ | | |
| | | / | | | | • | ∤ ∎∷∷ | | |
| 15 - 17 | S-6 | X | 9 - 10 - 10 - 10 | 4 | 20 | - | ¶ ∎:∷: | As Above, Little Gravel, Wet, Medium Dense (SP) | |
| | | VΝ | | | | · | 1 Ⅰ∷∷ | | |
| | | | | | | 1 . |] [| | |
| | | | | | | _ | ↓ Ⅰ∷ | | |
| | | | | | | . | ↓ ∎∷∷ | | |
| | | | | | | - | ↓ ∎∷ | | |
| | | | | | | 20.0 | ∤ ∥ ∷∷ | | |
| | | | | | | | ┨ ┃:::: | | |
| 0.0 | | V | | _ | | · · | † ∎∷∶ | | |
| 20 - 22 | S-7 | ΙÅΙ | 13 - 12 - 11 - 13 | 5 | 23 | |] | As Above (SP) | |
| | | $\langle \rangle$ | | | | _ | ↓ Ⅰ… | | |
| | | | | | | . | ↓ ∎∷ | | |
| | | | | | | _ | ↓ I | | |
| | | | | | | . | ∤ ∎∷∷ | | |
| | | | | | | - | ┨ | | |
| | | | | | | 25.0 | † ∎∷ି | | |
| | | | | | | - | † ∎∷∷ | | |
| | | | | | | ļ | | | I |



Boring No.: SB-5

Page 2 of 2

| Project: | | Propo | sed Fire Station | | | | | | | | WAI Pr | oject No.: | GJ2422032.Y00 | |
|-----------------|--------|----------|-------------------|---------------|---------|-----------|---------------------|---------|------------------|-------------------------|---------------|----------------|---------------------|-------------------|
| Location: | | - | 69 West Ramapo Ro | oad & | One Ang | gelus Dri | /e; Garnerville, | Town o | of Haverstraw, R | ockland County, | | Client: | Thiells Roseville I | Fire Department |
| Surface E | | | ± 404.0 fee | | | 1 | Date Started: | | 9/3/2024 | Wat | ter Depth | Elevation | 1 | Depth Elevation |
| Terminatio | on Dep | th: | 27.0 fee | t bgs | | | Date Complete | ed: | 9/3/2024 | | (feet bgs) | | (fe | et bgs) (feet) |
| Proposed | Locati | on: | SMP | | | | | RN | | During: | | <u>391.0</u> | | |
| Drill / Test | Metho | od: | HSA / SPT | | | | | GB | | At Completion | | | At Completion: | 13.0 391.0 📓 |
| | | | | | | | Equipment: | Diedric | ch D50 | 24 Hours: | | <u></u> ▼ | 24 Hours: | <u> </u> |
| | SA | MPLE | | I | | DEPTH | | | | - | | | | |
| Depth (foot) | No | Type | Blows Per 6" | Rec. (in.) | N | (feet) | STRAT | A | | DESCRIPTIO (Cla | ON OF M | | | REMARKS |
| (feet) | NO | Туре | Blows Fel 6 | () | | 25.0 | | | | (014 | Somouti | 511) | | |
| 25 - 25.1 | S-8 | \times | 50/1" | 1 | 50/1" | | GLACIAL DEPOSITS | | As Above, Some | Gravel, Little Silt, Ve | ery Dense (S | SP) | | |
| | | | | | | _ | DEPOSITS | | | | | | | |
| | | | | | | 27.0 | - | | | | | | | |
| | | | | | | 27.0 | | | Boring Log SB-5 | Ferminated at a Dep | oth of 27.0 F | eet Below Grou | und Surface Due to | |
| | | | | | | | 1 | | Auger Refusal | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | 30.0 | ┫ | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | 35.0 | + | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | | ļ | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | 40.0 | 4 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | · _ |] | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | | ┫ | | | | | | | |
| | | | | | | • | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | 45.0 | ┫ | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | | ┫ | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | _ | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | 50.0 | 4 | | | | | | | |
| | | | | | | 50.0 | ┫ | | | | | | | |
| | | | | | | | | | | | | | | |



Boring No.: SB-6

| Project: | | | osed Fire Station | | | | | | | | WAI Project No.: | GJ2422032.Y00 | |
|------------------|----------|-------------------|-------------------|---------------|--------|----------|---------------------|-----------|----------------------------------|-----------------------------|---|--------------------|---------------------------------------|
| Location: | _ | | 69 West Ramapo Ro | | One An | gelus Dr | | | | | | Thiells Roseville | |
| Surface E | | | ± 408.0 fee | | | | Date Started: | - | 9/4/2024 | | r Depth Elevation et bgs) (feet) | | Depth Elevation |
| Terminatio | - | | | t bgs | | | Date Complet | | 9/4/2024 | | | (16 | eet bgs) (feet) |
| Proposed | | | Pavement | | | | Logged By: | RN | | During: | 15.0 393.0 7 | | |
| Drill / Test | Metho | od: | HSA / SPT | | | | Contractor: | GB | ab DE0 | At Completion: 24 Hours: | | At Completion: | ജ |
| | | | | | | | Equipment: | Diedri | ch D50 | 24 Hours: | <u></u> ▼ | 24 Hours: | <u> </u> |
| | SA | MPL | E INFORMATION | | | DEPT | H STRAT | ГΔ | | DESCRIPTIO | N OF MATERIALS | | REMARKS |
| Depth (feet) | No | Туре | Blows Per 6" | Rec. (in.) | N | (feet) | UNA | | | | sification) | · | I I I I I I I I I I I I I I I I I I I |
| | | | | | | 0.0 | TOPSOIL | NUZ | 4" Tenecil | · · · · · | | | |
| | | N/ | | | | 0.3 | FILL | | 4" Topsoil Brown Sandy Silt, | Moist (FILL) | | | + |
| 0 - 2 | S-1 | IV. | 4 - 7 - 7 - 6 | 22 | 14 | | _ | 1888 | | | | | |
| | | IΛ | | | | | 4 | 1888 | | | | | |
| | | | | | | - | _ | 1888 | | | | | |
| | | NZ | | | | | - | | | | | | |
| 2 - 4 | S-2 | IX | 6 - 6 - 7 - 8 | 18 | 13 | | - | 1888 | Brown Poorly Gra | ded Sand, Little Grave | el, Moist (FILL) | | Reworked Natural |
| | | $V \setminus$ | | | | | - | 1888 | | | | | |
| | 1 | Ń | | | | 1 - |] | | | | | | |
| 4 - 6 | S-3 | IV | 7 - 9 - 13 - 11 | 17 | 22 | 5.0 | I | | As Above, No Gra | vel (FILL) | | | |
| - ⁻ U | 5-5 | $ \Lambda $ | , - | | 22 | | 1 | | , 10 Old | | | | |
| | <u> </u> | () | | | | - | 4 | | | | | | |
| | | ΝZ | | | | | 4 | | | | | | |
| 6 - 8 | S-4 | IX | 10 - 9 - 10 - 11 | 11 | 19 | - | - | | As Above (FILL) | | | | |
| | | $ / \setminus$ | | | | | - | | | | | | |
| | | (| | | | - | | | | | | | |
| | | IV | | | | | - | | | | | | |
| 8 - 10 | S-5 | ١Ň | 8 - 9 - 15 - 14 | 14 | 24 | | | | As Above (FILL) | | | | |
| | | $\langle \rangle$ | | | | 10.0 | | SXX. | | | | | |
| | | Ν/ | | | | | GLACIAL DEPOSITS | | | | | | |
| 10 - 12 | S-6 | IX | 9 - 10 - 8 - 7 | 15 | 18 | | DEFOOTO | | Brown Poorly Gra | ded Sand, Moist, Med | lium Dense (SP) | | |
| | | $ / \rangle$ | | | | | 4 | | | | | | |
| | | <u> </u> | | | | | | | | | | | |
| | | | | | | | - | | | | | | |
| | | | | | | - | | | | | | | |
| | | | | | | |] | | | | | | |
| | | | | | | | 4 | | | | | | |
| | | | ļ | | | 15.0 | 4 | | | | | | |
| | 1 | Λ | | | | | 4 | | | | | | |
| 15 - 17 | S-7 | X | 6 - 7 - 6 - 6 | 10 | 13 | - | - | | As Above (SP) | | | | |
| | 1 | $ / \rangle$ | l | | | | 4 | | | | | | |
| | | ſ | | | | 1 - | | | | | | | |
| | 1 | | | | | | I | | | | | | |
| | 1 | | | | | |] | | | | | | |
| | 1 | | | | | _ | 4 | | | | | | |
| | 1 | | | | | 00.0 | 4 | | | | | | |
| | | | | | | 20.0 | - | | | | | | |
| | | \mathbb{N} | | | | | 4 | | | | | | |
| 20 - 22 | S-8 | ΙX | 28 - 12 - 13 - 14 | 20 | 25 | - | 1 | | Brown Poorly Gra | ded Sand with Gravel | , Wet, Medium Dense (S | P) | |
| | | $V \setminus$ | | | | | 1 | | | | | | |
| | | | | | | 22.5 | | · · · · · | | | | | |
| | | | | | | _ | | | Boring Log SB-6 Auger Refusal | Ferminated at a Depth | of 22.5 Feet Below Grou | und Surface Due to | |
| | 1 | | | | | | 4 | | Auger Reiusal | | | | |
| | 1 | | | | | - | 4 | | | | | | |
| | 1 | | | | | 25.0 | 4 | | | | | | |
| | 1 | | | | | 20.0 | - | | | | | | |
| | | | | | | | | | | | | | ļ |



Boring No.: SB-7

| Project: | | Prop | osed Fire Station | | | | | | | | WAI Project N | o.: GJ2422032.Y00 | |
|--------------|---------|-------------------|-------------------|-------|--------|-----------|-----------------|-------------|----------------------|--------------------------|------------------|-------------------|---------------------|
| Location: | | | 69 West Ramapo Ro | bad & | One An | aelus Dri | ve: Garnerville | . Town | of Haverstraw R | ockland County. NY | - | | Fire Department |
| Surface El | levatio | | ± 412.0 fee | | _ / 11 | | Date Started: | | 9/4/2024 | 1 | Depth Elevat | | n Depth Elevation |
| Terminatio | | | | t bgs | | | Date Complet | - | 9/4/2024 | | et bgs) (feet) | | eet bgs) (feet) |
| Proposed | Locati | ion: | Pavement | - | | | Logged By: | RN | | During: | 20.0 392.0 | | |
| Drill / Test | | | HSA / SPT | | | | Contractor: | GB | | At Completion: | 20.0 392.0 | - | <u> </u> |
| | | | | | | | Equipment: | Diedri | ch D50 | 24 Hours: | | ¥ 24 Hours: | i |
| | 64 | MDL | | 1 | | | | | | · · · · | | ••• | |
| Depth | 5A | | | Rec. | 1 | DEPTI | H STRA | ТА | | DESCRIPTION | N OF MATERI | ALS | REMARKS |
| (feet) | No | Туре | Blows Per 6" | (in.) | N | (feet) | | | | (Class | sification) | | |
| ļ | | | | | | 0.0 | TOPSOIL | <u>\\\/</u> | Topsoil | | | | |
| | | NZ | | | | | FILL | 88 | | | | | 1 |
| 0 - 2 | S-1 | IX | 4 - 5 - 6 - 6 | 1 | 11 | - | _ | | Brown Poorly Gra | ded Sand, Dry (FILL) | | | |
| | | $V \setminus$ | | | | | - | | | | | | |
| | | | | | | 1 - | | | | | | | |
| 2 - 4 | S-2 | IV | 4 - 4 - 3 - 4 | 2 | 7 | _ | | | As Above (FILL) | | | | Reworked Natural |
| 2 7 | 02 | $ \Lambda $ | 0 - | - | , | | | | | | | | |
| | | () | | | | | | | | | | | |
| | | Λ | | | | 5.0 | 4 | | | | | | |
| 4 - 6 | S-3 | IX | 8 - 12 - 11 - 12 | 5 | 23 | 5.0 | _ | | As Above, Little G | iravel, Moist (FILL) | | | |
| | | $ / \setminus$ | | | | | 4 | | | | | | |
| | | \mathbf{k} | | | | 1 - | | | | | | | |
| 6 - 8 | S-4 | IV | 5 - 5 - 7 - 6 | 16 | 12 | | | | As About No Cro | | | | |
| 0-0 | 5-4 | I۸. | 5 - 5 - 7 - 6 | 10 | 12 | - | | | As Above, No Gra | iver (FILL) | | | |
| | | $\langle \rangle$ | | | | | | | | | | | |
| | | Λ / | | | | | _ | | | | | | |
| 8 - 10 | S-5 | IX | 3 - 4 - 5 - 9 | 24 | 9 | - | _ | | As Above (FILL) | | | | |
| | | V | | | | 10.0 | _ | | | | | | |
| | | () | | | | | GLACIAL | | | | | | 4 |
| 10 - 12 | S-6 | IV | 6 - 6 - 8 - 9 | 21 | 14 | | DEPOSITS | | Brown Boorly Cro | ded Sand, Moist, Medi | ium Donoo (SD) | | |
| 10-12 | 3-0 | IV. | 0 - 0 - 8 - 9 | 21 | 14 | | | | Brown Poony Gra | ded Sand, Moist, Medi | Ium Dense (SF) | | |
| | | () | | | | - 1 | _ | | | | | | |
| | | | | | | | - | | | | | | |
| | | | | | | - | | | | | | | |
| | | | | | | | _ | | | | | | |
| | | | | | | - | | | | | | | |
| | | | | | | 15.0 |] | | | | | | |
| | | Λ / | | | | | 4 | | | | | | |
| 15 - 17 | S-7 | X | 5 - 7 - 7 - 8 | 20 | 14 | - | 4 | | As Above (SP) | | | | |
| | | $ / \rangle$ | | | | | 4 | | | | | | |
| | | \vdash | | | | 1 - | 4 | | | | | | |
| | | | | | | | 1 | | | | | | |
| | | | | | | - |] | | | | | | |
| | | | | | | _ | 1 | | | | | | |
| | | | | | | 00.0 | 4 | | | | | | |
| | | | | | | 20.0 | Ţ | | | | | | Water @ 20.0 fbgs |
| | | \mathbb{N} | | | | | 4 | | | | | | |
| 20 - 22 | S-8 | ١X | 4 - 4 - 4 - 12 | 24 | 8 | 21.5 | | | As Above, Wet, Lo | oose (SP) | | | |
| | | V | | | | | 1 | | Brown Silt, Little G | Gravel, Little Clay, Wet | t, Hard (ML) | | Qu = 4.0 tsf |
| | | | | | |] – |] | | | | | | |
| | | | | | | _ | 4 | | | | | | |
| | | | | | | | 4 | | | | | | |
| l. | | | | | | - | 4 | | | | | | |
| | | | | | | 25.0 | 4 | | | | | | |
| l. | | | | | | | 4 | | | | | | † |
| | | | | | | ļ | | | | | | | |



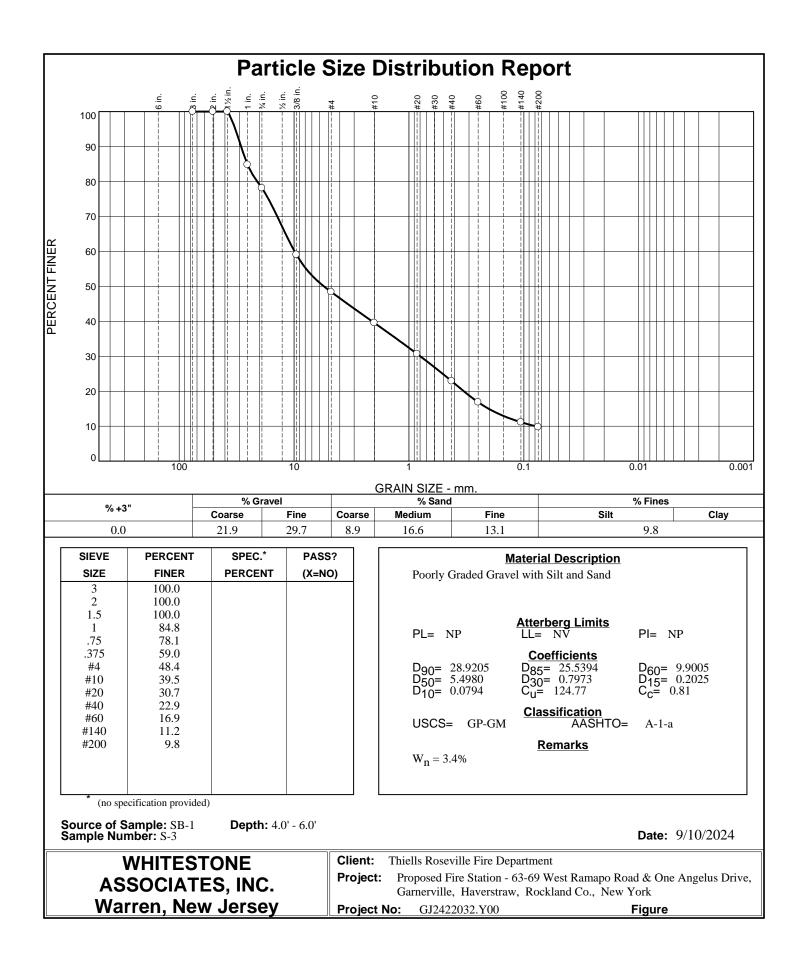
Boring No.: SB-7

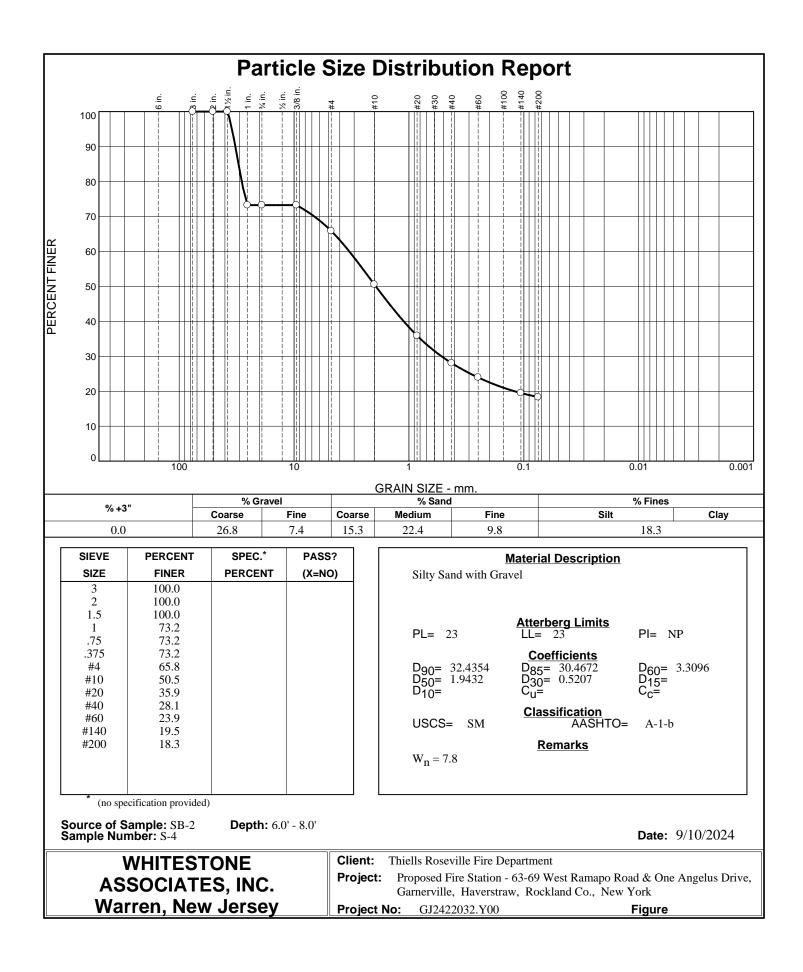
Page 2 of 2

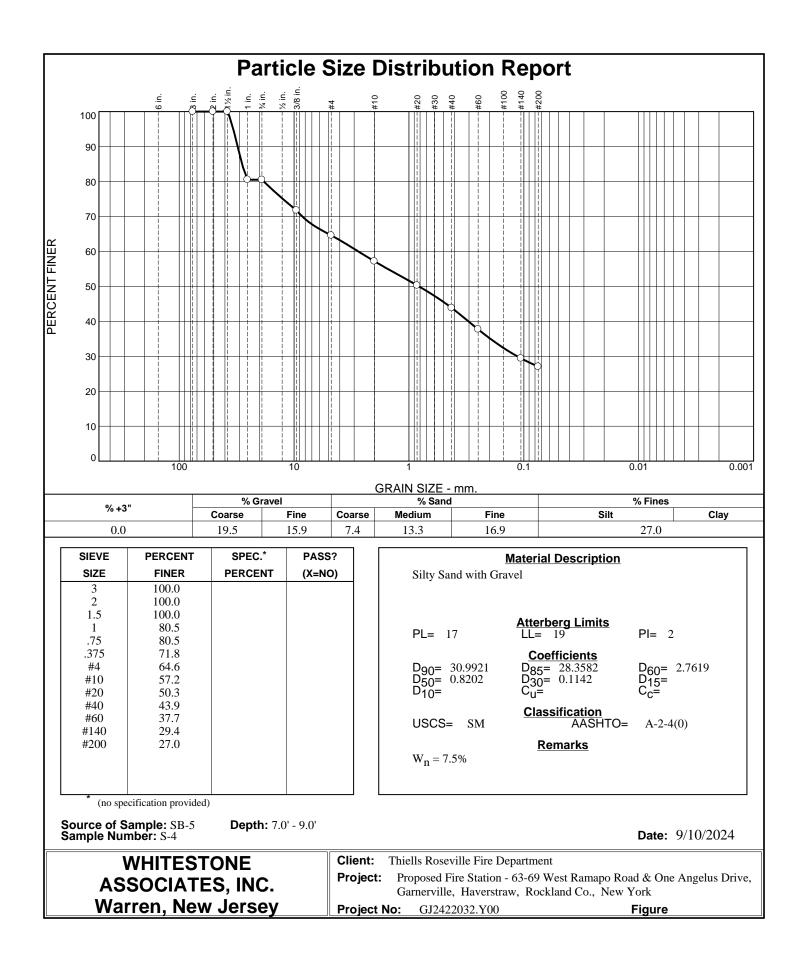
| Project: | | Propo | osed Fire Station | | | | | | | | WAI Pro | oject No.: | GJ2422032.Y00 | |
|--------------|--------|----------|-------------------|-------|--------|----------------|------------------|--------------------|-----------------|------------------------|---------------|---------------|---------------------|-------------------|
| Location: | | | 69 West Ramapo Ro | oad & | One An | gelus Dri | ve; Garnerville, | , Town o | of Haverstraw, | Rockland County, N | | Client: | Thiells Roseville F | Fire Department |
| Surface El | | | ± 412.0 feet | | | 1 | Date Started: | | 9/4/2024 | Wate | er Depth | Elevation | | Depth Elevation |
| Terminatio | on Dep | th: | 27.0 feet | t bgs | | | Date Complet | ed: | 9/4/2024 | (f | ieet bgs) | | (fee | et bgs) (feet) |
| Proposed | Locati | on: | Pavement | | | | Logged By: | RN | | During: | 20.0 | 392.0 🐺 | | |
| Drill / Test | Metho | od: | HSA / SPT | | | | Contractor: | GB | | At Completion: | 20.0 | | At Completion: | <u> b</u> |
| | | | | | | | Equipment: | Diedri | ch D50 | - ^{24 Hours:} | <u> </u> | <u> </u> | 24 Hours: | <u> </u> |
| | SA | MPL | E INFORMATION | | | DEPTH | 4 | | | • | | | | |
| Depth | | | | Rec. | | | STRA1 | ΓA | | DESCRIPTIC | | | i | REMARKS |
| (feet) | No | Туре | Blows Per 6" | (in.) | N | (feet) 25.0 | | | | (Clas | ssificatio | n) | | |
| | | | | | | | GLACIAL | | | | | | | |
| 25 - 27 | S-9 | V | 23 - 21 - 23 - 38 | 4 | 44 | | DEPOSITS | | Draws Daark (C | raded Sand with Grave | Wat Dana | | | |
| 29 - 21 | 5-9 | Λ | 23 - 21 - 23 - 38 | 1 | 44 | |] | | BrownPoorly G | raded Sand with Grave | a, wei, Dens | ie (SP) | | |
| | | $ \land$ | | | | 27.0 | | <u> • • • • •</u> | Desing Log CD | 7 Terminated at a Dani | th of 27.0 Fo | at Dalaur Cra | und Curfore | |
| | | | | | | | 4 | | Boning Log SB- | 7 Terminated at a Dept | un ol 27.0 Fe | et below Gro | und Sunace | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | · · | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | 30.0 | 4 | | | | | | | |
| | | | | | | · | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | · · | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | 35.0 | 1 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | · · | 4 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | 40.0 | 4 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | |] | | | | | | | |
| | | | | | | , | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | · · | 4 | | | | | | | |
| | | | | | | - | 1 | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | 45.0 | 4 | | | | | | | |
| | | | | | | 45.0 | 4 | | | | | | | |
| | | | | | | · · | 4 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | _ | 4 | | | | | | | |
| | | | | | | · | 4 | | | | | | | |
| | | | | | | - | 4 | | | | | | | |
| | | | | | | · · | 1 | | | | | | | |
| | | | | | | | 1 | | | | | | | |
| | | | | | | 50.0 | 4 | | | | | | | |
| | | | | | | | | | | | | | | |



APPENDIX B Laboratory Test Results









APPENDIX C Infiltration Test Results

| Client: | Thiells Rose | ville Fire Depa | rtment | _ 1 | fest Hole No.: | I-1 | |
|---------------------|--------------|---------------------------------|--------|----------------------|---------------------------------|--------------------------|-------------------------------|
| – • <i>i</i> | | | | - | Date: | 9/3/2024 to 9/4/ | 2024 |
| Project: | Proposed Fi | re Station | | - | Weather: | Sunny, 74° | |
| Location: | | st Ramapo Roa | | _ Fi | eld Engineer: | RN | |
| | | Drive; Garner erstraw, Rockl | | - | ace Elevation: | 406.0 | |
| File No. | GJ2422032. | Y00 | | | Depth (Feet): h (Elevation): | 8.0 398.0 | |
| | т | ime | | vel Reading :hes) | Water | T | |
| Reading No. | Start | Finish | Start | Finish | Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
| PS | 12:05 | 12:05 | 24.0 | 0.0 | 24.0 | 24.0 | - |
| 1 | 12:05 | 1:05 | 24.0 | 4.0 | 20.0 | 1.0 | 20.0 |
| 2 | 1:05 | 2:05 | 24.0 | 4.5 | 19.5 | 1.0 | 19.5 |
| 3 | 2:05 | 3:05 | 24.0 | 5.0 | 19.0 | 1.0 | 19.0 |
| 4 | 3:05 | 4:05 | 24.0 | 5.0 | 19.0 | 1.0 | 19.0 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | 1 | | | | | | |
| | | | | | | | |

Г

| | HITEST | | | | | TRATIO | |
|----------------|--------------|--------------------------------|-------------|--------------------|--------------------------------|--------------------------|-------------------------------|
| Client: | Thiells Rose | ville Fire Depa | rtment | - T | est Hole No.: | I-2 | |
| | | | | - | Date: | 9/3/2024 to 9/4/ | 2024 |
| Project: | Proposed Fi | re Station | | - | Weather: | Sunny, 74° | |
| Lesstion | <u> </u> | | | - | | | |
| Location: | | st Ramapo Roa Drive; Garner | | | eld Engineer: | RN | |
| | Town of Have | erstraw, Rockl | and Co., NY | - | ce Elevation: Depth (Feet): | 402.0 8.0 | |
| File No. | GJ2422032. | Y00 | | | h (Elevation): | 394.0 | |
| Deeding | Т | ime | | el Reading hes) | Water | Time Informal | Deta of Flow |
| Reading No. | Start | Finish | Start | Finish | Level Fall (Inches) | Time Interval (Hours) | Rate of Flow (Inches/Hour) |
| PS | 11:10 | 11:10 | 24.0 | 12.0 | 12.0 | 24.0 | - |
| 1 | 11:10 | 12:10 | 24.0 | 23.5 | 0.5 | 1.0 | 0.5 |
| 2 | 12:10 | 1:10 | 24.0 | 23.75 | 0.25 | 1.0 | 0.25 |
| 3 | 1:10 | 2:10 | 24.0 | 23.75 | 0.25 | 1.0 | 0.25 |
| 4 | 2:10 | 3:10 | 24.0 | 23.75 | 0.25 | 1.0 | 0.25 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Г



APPENDIX D Supplemental Information (USCS, Terms & Symbols)



UNIFIED SOIL CLASSIFICATION SYSTEM

| | MAJOR DIVISIONS | | LETTER SYMBOL | TYPICAL DESCRIPTIONS |
|---|--|--|------------------|---|
| | GRAVEL AND | CLEAN GRAVELS | GW | WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES |
| | GRAVELLY SOILS | (LITTLE OR NO FINES) | GP | POORLY-GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES |
| COARSE GRAINED SOILS | MORE THAN 50% OF COARSE FRACTION | GRAVELS WITH FINES | GM | SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES |
| | RETAINED ON NO. 4 SIEVE | (APPRECIABLE AMOUNT OF FINES) | GC | CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES |
| | SAND AND SANDY | CLEAN SAND (LITTLE OR NO | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | SOILS | FINES) | SP | POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| MORE THAN | MORE THAN 50% OF COARSE FRACTION <u>PASSING</u> NO. 4 SIEVE | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | SM | SILTY SANDS, SAND-SILT MIXTURES |
| 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | | | SC | CLAYEY SANDS, SAND-CLAY MIXTURES |
| FINE | SILTS AND CLAYS | LIQUID LIMITS LESS THAN 50 | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| GRAINED SOILS | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| MORE THAN 50% OF MATERIAL IS | | | МН | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |
| SMALLER THAN NO. 200 SIEVE | SILTS AND CLAYS | LIQUID LIMITS <u>GREATER</u> THAN 50 | СН | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS |
| SIZE | | | ОН | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| ŀ | HIGHLY ORGANIC SOILS | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

| TRACE | 1% | то | 10% |
|--------|-----|----|-----|
| LITTLE | 10% | то | 20% |
| SOME | 20% | то | 35% |
| AND | 35% | то | 50% |

COMPACTNESS* Sand and/or Gravel

| RELATIVE |
|----------|
| DENSITY |

| 1% TO 10% | LOOSE 0% TO 4 | 40% |
|------------|-----------------------|-----|
| 10% TO 20% | MEDIUM DENSE 40% TO 7 | 70% |
| 20% TO 35% | DENSE 70% TO 9 | 90% |
| 35% TO 50% | VERY DENSE 90% TO 10 |)0% |
| | | |

CONSISTENCY* Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

| VERY SOFT | LESS THAN 250 |
|------------|----------------|
| SOFT | 250 TO 500 |
| MEDIUM | 500 TO 1000 |
| STIFF | 1000 TO 2000 |
| VERY STIFF | 2000 TO 4000 |
| HARD GRE | ATER THAN 4000 |

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

Office Locations:

New Jersey

PENNSYLVANIA

MASSACHUSETTS

CONNECTICUT

FLORIDA



GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
- Qu: Unconfined compressive strength, TSF.
- Qp: Penetrometer value, unconfined compressive strength, TSF.
- Mc: Moisture content, %.
- LL: Liquid limit, %.
- PI: Plasticity index, %.
- δd: Natural dry density, PCF.
- ▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
- SS: Split-Spoon 1 ³/₈" I.D., 2" O.D., except where noted.
- ST: Shelby Tube 3" O.D., except where noted.
- AU: Auger Sample.
- OB: Diamond Bit.
- CB: Carbide Bit
- WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)

| Very Loose | 0-4 |
|--------------|---------|
| Loose | 4-10 |
| Medium Dense | 10-30 |
| Dense | 30-50 |
| Very Dense | Over 50 |

| Term (Cohesive Soils) | <u>Qu (TSF)</u> |
|-----------------------|-----------------|
| Very Soft | 0 - 0.25 |
| Soft | 0.25 - 0.50 |
| Firm (Medium) | 0.50 - 1.00 |
| Stiff | 1.00 - 2.00 |
| Very Stiff | 2.00 - 4.00 |
| Hard | 4.00 + |

PARTICLE SIZE

| Boulders | 8 in.+ | Coarse Sand | 5mm-0.6mm | Silt | 0.074mm-0.005mm |
|----------|-----------|-------------|---------------|------|-----------------|
| Cobbles | 8 in3 in. | Medium Sand | 0.6mm-0.2mm | Clay | -0.005mm |
| Gravel | 3 in5mm | Fine Sand | 0.2mm-0.074mm | • | |

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

MASSACHUSETTS

New Jersey

PENNSYLVANIA

CONNECTICUT

Office Locations:

Florida

Standard Penetration Resistance

APPENDIX B: FINISH SCHEDULE

Thiells-Roseville Fire District - TRFD2302

New 26-100 Fire Headquarters

NOTE: 1. All items listed are basis-of-design and are intended for bid pricing. All final colors and finishes to be approved during construction by Owner/Architect. Any product substitutions must be submitted as a Product Substitution as outlined in Division 01 of the Project Manual. 2. This schedule serves as a general list of finish items and is not a list of all finish items within a room or space. Refer to all contract documents, drawings and specifications to determine all required finishes and finish items.

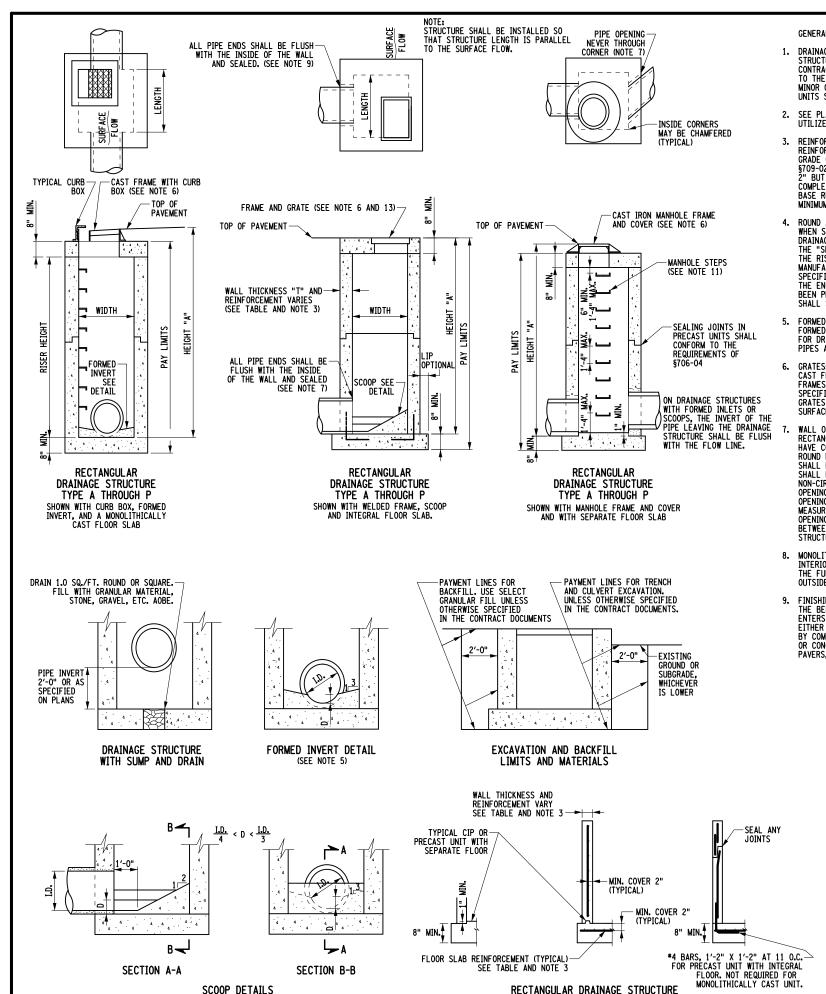
| | Manufacturer | Product | Color/Finish | Comments |
|---|--------------------------------------|--|---|--|
| Finish Schedule - First Floor | | | | |
| Stair A & Stair B: | | | | |
| Floor (Main Landings): | Mannington | Amtico Signature - Abstract | Etch Sienna | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Off-White | |
| Wall Paint: | Sherwin Williams | • · | SW7042 Shoji White | |
| Wall Covering (at intermediate landing): | Momentum | Symphony - Simply Sheer | Scarlet | |
| Stair Treads, Risers and Intermediate Landings: | Mannington | Colorspec | Off-White | |
| Stair Tread (Abrasive Insert) | Mannington | Colorspec | Brick | |
| Metal Stair Stringers: | Sherwin Williams | | SW7675 Sealskin | |
| Stair Railing: | Sherwin Williams | | SW7675 Sealskin | |
| HM Door Frame Paint (interior door): | Sherwin Williams | | SW7675 Sealskin | |
| Display Case Wood: | Casework stained to match wood doors | | | |
| Wood Doors (to corridor): | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| | 1 Industrio | Allointeetailai Hised Deeloi, Hinte eait | moona, maz i | |
| Elevator Cab | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Etch Sienna | 12"x18" |
| Applied Laminate Wall Panels (Sides): | By Elev. Manufacturer | Single Toned Laminate | Wallaby | |
| Applied Laminate Wall Panels (Rear): | By Elev. Manufacturer | Wood Laminate | Macchiato Walnut | |
| Reveals: | By Elev. Manufacturer | | Brushed Stainless Steel | |
| Base Finish: | By Elev. Manufacturer | | Brushed Stainless Steel | |
| Handrails: | By Elev. Manufacturer | | Brushed Stainless Steel | |
| Entrance Door & Jamb Finish: | By Elev. Manufacturer | | Brushed Stainless Steel | |
| Fixture Faceplate Finish (at hallway): | By Elev. Manufacturer | | Brushed Stainless Steel | |
| Ceiling: | By Elev. Manufacturer | | Stainless Steel with LED Rectangular Lights | |
| ooming. | By Elev. Manadotaler | | | |
| Corridor 100 / Vestibule 100A | | | | |
| Floor - LVT: | Mannington | Amtico Signature - Abstract | Etch Sienna | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Off-White | |
| Wall Paint: | Sherwin Williams | 5 1 | SW7042 Shoji White | |
| HM Door Frames: | Sherwin Williams | | SW7675 Sealskin | |
| Exposed Steel Paint | Sherwin Williams | | SW7675 Sealskin | |
| Plastic Laminate Wall Accent: | Wilsonart | | Mangalore Laminate, Velvet Finish | *Plastic Laminate color dependent on Wood Door Selection |
| Ceiling: | Armstrong | Calla - ACP | White | |
| | | | | |
| Janitor's Closet 101A | | | | |
| Floor Tile and Base: | Daltile | Synchronic | SY31 Beige | 12x24 |
| FRP Wall Protection: | Marlite | Standard FRP - Pebbled | 199 Bright White | |
| Wall Paint (Above FRP): | Sherwin Williams | | SW 7007 Ceiling Bright White | |
| Ceiling: | Armstrong | ACP | Cermaguard - White | |
| Ť | i i i | • | | |
| Womens Toilet 101 / Mens Toilet 103 | | | | |
| Floor Tile: | Daltile | Synchronic | SY31 Beige | 12x24 |
| Floor Cove Transition: | Schulter | Dilex - EHK | Stainless Steel | |
| Wall Tile: | Marazzi | Zellige Neo | ZL11 Gesso | 3x12" stacked bond |
| Toilet Partitions: | Scranton | 5 | Shale - Orange Peel Texture | |
| Sink Deck: | Bradley | Omni Deck - Terreon | Glacier | |
| HM Door Frame Paint: | Sherwin Williams | | SW 7675 Sealskin | |
| Wood Doors: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| | | , controlar mood boord, milling Oak | | |
| Ceiling: | Armstrong | ACP | Calla - White | |

| Chief's Office 102 / Chief's Storage 102A | | | | |
|---|--------------------------------|--|--|--|
| Floor: | Mannington | Amtico Signature - Abstract | Stitch Stoneware (AR0AST51) | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| HM Frame Paint (doors): | Sherwin Williams | | SW 7675 Sealskin | |
| Doors: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP | Calla - White | |
| Solar Shade: | Mechoshade | Manual Urban Shade, 5% ThermoVeil | Eggshell | |
| Window Sill: | | White Oak Sill stained to match doors | | |
| | | | | |
| Conference Room 104 | | | | |
| Floor - Carpet: | Patcraft | Restorative I0626 | Sage | Brick Installation |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| Accent Wall Paint (Head Walls): | Sherwin Williams | | SW 6187 Rosemary | |
| HM Frame Paint (Door): | Sherwin Williams | | SW 7675 Sealskin | |
| Wood Doors: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP - Calla | White | |
| Soffit Paint: | Sherwin Williams | | SW 7007 Ceiling Bright White | |
| | | | | |
| Fitness Room 105 | Tardaatt | Organization Organization | F04 Obversatio | 4/48 Thistory |
| Floor: | Tarkett | Commotion Sports Flooring | 524 Chromatic | 1/4" Thickness |
| Wall Paint: | Sherwin Williams | Edge Effects Or detailed with Deck. Of Et 1 | SW 9173 Shiitake | |
| Wall Base: | Mannington Shanvin Williama | Edge Effects Sculptured Wall Base - 3" Flair | Black | |
| Exposed Structure Paint: | Sherwin Williams | | SW 7675 Sealskin | |
| Exposed Decking & Soffit Paint: Ceiling: | Sherwin Williams | ACP | SW 7757 High Reflective White Calla - White | |
| Window Sill: | Armstrong | White Oak Sill stained to match: | Calla - Willie | |
| Willdow Sill. | | White Oak Sin stamed to match. | | |
| Shower Room 105A | | | | |
| Floor Tile: | Daltile | Synchronic | SY31 Beige | 12x24 |
| Floor Cove Transition: | Schulter | Dilex - EHK | Stainless Steel | 12X24 |
| Wall Tile: | Marazzi | Zellige Neo | ZL11 Gesso | 3x12" stacked bond |
| Sink Deck: | Bradley | Omni Deck - Terreon | Glacier | SX12 Stacked bolid |
| Exposed Structure Paint: | Sherwin Williams | Onini Deck - Teneon | SW 7675 Sealskin | |
| Wood Door: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP | Cermaguard - White | |
| Soffit Paint: | Sherwin Williams | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | SW 7007 Ceiling Bright White | |
| Shower Receptor: | Inpro | | Bright White P9011 | |
| Window Sill: | | White Oak Sill stained to match doors | 5 | |
| | | | | |
| Line Officers 106 | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Stitch Stoneware (AR0AST51) | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| HM Frame Paint (doors): | Sherwin Williams | | | |
| Wood Door: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Interior Aluminum Window Frame: | | | Dark Bronze | (to match exterior windows & HM frame paint) |
| Ceiling: | Armstrong | ACP | Calla - White | |
| Window Sill: | | White Oak Sill stained to match doors | | |
| | | | | |
| Day Room 107 | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Etch Sienna | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Off-White | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| Storefront Windows & Doors: | | | Dark Bronze | |
| Window Sill: | | White Oak Sill stained to match doors | | |
| HM Frame Paint (interior door): | Sherwin Williams | | SW7675 Sealskin | |
| Wood Door (interior door): | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP | Calla - White | |
| Solar Shade: | Mechoshade | Manual Urban Shade, 5% ThermoVeil | Eggshell | |
| Millwork Wood Veneer | 0.1. | White Oak stained to match doors | | |
| Countertop Material: | Cambria | Signature Series | Ridgegate | 4.0 Marazia Otashad kanal |
| Tile Backsplash: | Daltile | Miramo - Glazed Ceramic | Reef MR49 | 1x6 Mosaic, Stacked bond |
| | | | | |
| Uniform Storage 108 | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Stitch Stoneware (AR0AST51) | |
| Wall Base: | Roppe | 4" Toe | Black Brown | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| HM Frame Paint (doors): | Sherwin Williams | | SW7675 Sealskin | |
| | | | | |
| Wood Door: Ceiling: | VT Industries Armstrong | Architectural Wood Doors: White Oak ACP | Mocha, MA24 Calla - White | |

| Women's Auxillary 109 | | | | |
|--|--|---|---------------------------------------|---------|
| Floor: | Mannington | Amtico Signature - Abstract | Stitch Stoneware (AR0AST51) | |
| | | Edge Effects Sculptured Wall Base - 3" Flair | | |
| Wall Base: Wall Paint: | Mannington Sherwin Williams | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown SW7042 Shoji White | |
| HM Frame Paint (doors): | Sherwin Williams | | SW7042 Shoji White SW7675 Sealskin | |
| | | | | |
| Wood Door: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP | Calla - White | |
| | | | | |
| Utility Room 110 | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Etch Sienna | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Natural | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| Exposed Steel Paint | Sherwin Williams | | SW7675 Sealskin | |
| HM Frame Paint (doors): | Sherwin Williams | | SW7675 Sealskin | |
| Wood Door: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP | Calla - White | |
| | | | | |
| Decon Transition 111/Gear Area 112/ Decon Bathroom 113/Outd | oor Storage 114/Laundry115/Fire Gear Sto | rage 116/Work Room 117/Decon Transition 118/ SCBA 121 | | |
| Epoxy Floor & Base: | Dura-A-Flex | Q-11 Quartz | Q11-13 | |
| Walk Off Mat (Decon Transitions 111 & 118 ONLY) | Babcock Davis | GRATEdesign - Rugged Scrub Insert | Charcoal | |
| Walk On Mar (Decon manations in the into one ry | Sherwin Williams | Sint reading - radged dorab insert | SW 9173 Shiitake | |
| Exposed Decking & Ceiling Structure: | Sherwin Williams | | SW 7757 High Reflective White | |
| Exposed Decking & Cening Structure. Exposed Vertical Structure Paint (Columns & Bracing): | Sherwin Williams | | SW 7675 Sealskin | |
| Railings (Stair C): | Sherwin Williams | | SW 7675 Sealskin SW 6328 Fireweed | |
| | | | | |
| HM Door Frame Paint: | Sherwin Williams | | SW 7675 Sealskin | |
| HM Door Paint | Sherwin Williams | | SW 7675 Sealskin | |
| Shower Receptor (Decon BR): | Inpro | | Bright White P9011 | |
| | | | | |
| Apparatus Bay 120 | | | | |
| Epoxy Floor & Base: | Dura-A-Flex | Q-11 Quartz | Q11-13 | |
| Wall Paint (Above & Below Stripe): | Sherwin Williams | | SW 9173 Shiitake | |
| Accent Stripe: | Sherwin Williams | | SW 6328 Fireweed | |
| Bail Out Window Horizontal Wall Surround: | Sherwin Williams | | SW 6328 Fireweed | |
| Bail Out Guard: | Sherwin Williams | | SW7675 Sealskin | |
| Exposed Decking & Joists: | Sherwin Williams | | SW 7757 High Reflective White | |
| Exposed Structure Paint (Beams, Columns & Bracing): | Sherwin Williams | | SW 7675 Sealskin | |
| HM Door Frame Paint: | Sherwin Williams | | SW7675 Sealskin | |
| HM Door Paint | Sherwin Williams | | SW7675 Sealskin | |
| | | | officie coulous | |
| Radio Room 119: | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Stitch Stoneware (AR0AST51) | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | 12 X10 |
| Wall Paint: | Sherwin Williams | Euge Ellects Sculptured Wall Base - 5 Flair | SW7042 Shoji White | |
| HM Door Frame Paint: | Sherwin Williams | | SW 7675 Sealskin | |
| | | | SW 7675 Sealskin SW 7675 Sealskin | |
| HM Door: | Sherwin Williams | | | |
| Exposed Steel Paint | Sherwin Williams | | SW7675 Sealskin | |
| Interior Aluminum Window Frame: | Kawneer | | Dark Bronze | |
| Ceiling: | Armstrong | ACP | Cermaguard - White | |
| Window Sill: | | White Oak Sill stained to match doors | | |
| | | | | |
| Delivery Room 122: | | | | |
| Floor & Base: | Daltile | Synchronic | SY31 Beige | 12x24 |
| Floor Base: | Daltile | Synchronic | SY31 Beige | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| Exterior: HM Door Frame (Paint): | Sherwin Williams | | SW7675 Sealskin | |
| Exterior: HM Man Door (Paint): | Sherwin Williams | | SW7675 Sealskin | |
| Interior: HM Door Frame (Paint): | Sherwin Williams | | SW7675 Sealskin | |
| Interior: Wood Door: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| Ceiling: | Armstrong | ACP | Cermaguard - White | |
| | , amonong | //01 | Connagadia - Willo | |
| | | | + | |
| Finish Schedule - Mezzanine | | | | |
| rinish Schedule - Mezzahline | | | | |
| | | | | |
| Storage M01/ Utility M02/ File Storage M03/ IT M04 | | | 1 | |
| Floor: | Clear Sealed Concrete | | | |
| Floor Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Wall Paint: | Sherwin Williams | | SW 9173 Shiitake | |
| HM Door Frame (Paint): | Sherwin Williams | | SW7675 Sealskin | |
| HM Man Door (Paint): | Sherwin Williams | | SW7675 Sealskin | |
| Exposed Decking & Ceiling Structure: | Sherwin Williams | | SW 7757 High Reflective White | |
| Exposed Vertical Structure Paint (Columns & Bracing): | Sherwin Williams | | SW 7675 Sealskin | |
| | | | | |

| Finish Schedule - Second Floor | | | | |
|--|--|---|---|--|
| Inish Schedule - Second Hoon | | | | |
| Corridor 200: | | | | |
| Floor - LVT: | Mannington | Amtico Signature - Abstract | Etch Sienna | 12"x18" |
| Wall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Natural 122 | |
| Wall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| HM Door Frames: | Sherwin Williams | | SW7675 Sealskin | |
| Exposed Steel Paint | Sherwin Williams | | SW7675 Sealskin | |
| Plastic Laminate Wall Accent: | Wilsonart | | Mangalore Laminate, Velvet Finish | *Plastic Laminate color dependent on Wood Door Selection |
| Ceiling: | Armstrong | Calla - ACP | White | |
| g- | | | | |
| Kitchen 201 & Pantry 201A: | | | | |
| Floor Tile: | Daltile | Quarry Tile | Arid Flash 0Q48 Abrasive | 6x6 Floor Tile, Bullnose Base |
| Vall Base: | Daltile | Quarry Tile | Arid Flash 0Q48 Abrasive | 6x6 Floor Tile, Bullnose Base |
| Vall Tile: | Daltile | Colorwheel Linear | Artic White | 6"x18" |
| Ceiling: | Armstrong | ACP | Kitchen Zone - White | 0 X 10 |
| connig. | Amoung | //01 | Rithlen Zone - White | |
| Commissioner 202: | | | | |
| loor: | Patcraft | Suburban Abstract | Railcar 00700 | Brick Installation |
| loor Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown 193 | Bhok motalidion |
| /all Paint: | Sherwin Williams | Luge Lifects Occuptured Wall Dase - 3 Fidil | SW7042 Shoji White | |
| eiling: | Armstrong | ACP | Calla | |
| eiing: /indow Sill: | Allistony | White Oak Sill stained to match doors | | |
| | Mashaahada | | Faceball | |
| olar Shade: | Mechoshade | Manual Urban Shade, 5% ThermoVeil | Eggshell | |
| xposed Steel Paint | Sherwin Williams | | SW 7675 Sealskin | |
| | | | | |
| fulti-Purpose Room 203 & 203B: | | | | |
| VT Floor - Border: | Mannington | Amtico Signature - Abstract | Stucco Nutmeg (AR0AUC89) | |
| VT Floor - Main Field: | Mannington | Amtico Signature - Abstract | Etch Sienna (AR0AET13) | |
| Vall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Vall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| Ceiling - Soffit Paint: | Sherwin Williams | | SW 7007 Ceiling Bright White | |
| eiling - Metal Acoustical Baffle: | Armstrong | IMMIX Blades | La Jolla Oak (SQLO) | Black Backer Panel |
| M Door Frame Paint: | Sherwin Williams | | SW 7675 Sealskin | |
| Vood Doors: | VT Industries | Architectural Wood Doors: White Oak | Mocha, MA24 | |
| iolar Shade: | Mechoshade | Manual Urban Shade, 5% ThermoVeil | Eggshell | |
| Aillwork Wood Veneer: | | White Oak Stained to Match Doors | | |
| Countertop Material: | Cambria | Signature Series | Ridgegate | |
| File Backsplash: | Daltile | Miramo - Glazed Ceramic | Reef MR49 | 1x6 Mosaic, Stacked bond |
| Footrail: | Ballio | | Oil Rubbed Bronze | |
| oodull. | | | OIL TRADDed Di Gliže | |
| Multi-Purpose Storage 204: | | | | |
| Floor: | Mannington | Amtico Signature - Abstract | Stucco Nutmeg (AR0AUC89) | |
| Vall Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Vall Paint: | Sherwin Williams | Edge Ellects Sculptured Wall Base - 5 Flail | SW7042 Shoji White | |
| | | 108 | | |
| Ceiling: | Armstrong | ACP | Calla | |
| | | | | |
| Purchasing 205: | Deterre# | Output an Abote at | D-il 00700 | Deiala la stallation |
| loor: | Patcraft | Suburban Abstract | Railcar 00700 | Brick Installation |
| loor Base: | Mannington | Edge Effects Sculptured Wall Base - 3" Flair | Black Brown | |
| Vall Paint: | Sherwin Williams | | SW7042 Shoji White | |
| Ceiling: | Armstrong | ACP | Calla | |
| | | | | |
| | | | | |
| | | | | |
| loor: | Patcraft | Suburban Abstract | Railcar 00700 | Brick Installation |
| loor: loor Base: | Mannington | | Railcar 00700 Black Brown | Brick Installation |
| loor: loor Base: Vall Paint: | Mannington Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair | Railcar 00700 Black Brown SW7042 Shoji White | Brick Installation |
| loor: loor Base: Vall Paint: | Mannington | Suburban Abstract | Railcar 00700 Black Brown | Brick Installation |
| loor: Ioor Base: /all Paint: eeiling: | Mannington Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair | Railcar 00700 Black Brown SW7042 Shoji White | Brick Installation |
| loor: loor Base: Vall Paint: Seiling: V. Toillet 207 & M. Toillet 209: | Mannington Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair | Railcar 00700 Black Brown SW7042 Shoji White Calla | |
| loor: loor Base: // all Paint: /eiling: // Toilet 207 & M. Toilet 209: | Mannington Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP | Railcar 00700 Black Brown SW7042 Shoji White Calla | Brick Installation |
| loor: loor Base: All Paint: eiling: /. Toilet 207 & M. Toilet 209 <u>:</u> loor Tile: | Mannington Sherwin Williams Armstrong | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair | Railcar 00700 Black Brown SW7042 Shoji White | |
| loor: loor Base: /all Paint: eiling: /. Toilet 207 & M. Toilet 209: loor Tile: loor Toile: loor Cove Transition: | Mannington Sherwin Williams Armstrong Daltile Schulter | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel | 12x24 |
| loor: loor Base: vall Paint: ieiling: V. Toilet 207 & M. Toilet 209: loor Tile: loor Cove Transition: vall Tile: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic | Railcar 00700 Black Brown SW7042 Shoji White Calla SV31 Beige Stainless Steel ZL11 Gesso | |
| loor: loor Base: vall Paint: veiling: V. Toilet 207 & M. Toilet 209: loor Tile: loor Cove Transition: vall Tile: ioiet Partitions: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture | 12x24 |
| loor: loor Base: /all Paint: eiling: /. Toilet 207 & M. Toilet 209: /. Toilet Partitions: /. Toilet Partitions: ink Deck: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier | 12x24 |
| loor: Ioor Base: Vall Paint: Selling: V. Toilet 207 & M. Toilet 209: Ioor Tile: Ioor Cove Transition: Vall Tile: Sollet Partitions: Sink Deck: M Door Frame Paint: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin | 12x24 |
| loor: loor Base: Vall Paint: beiling: V. Toilet 207 & M. Toilet 209: loor Tile: loor Cove Transition: Vall Tile: liot Partitions: link Deck: IM Door Frame Paint: Vood Doors: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 | 12x24 |
| ioor Base: ioor Base: Vall Paint: Deiling: V. Toilet 207 & M. Toilet 209: ioor Tile: ioor Tile: ioor Cove Transition: Vall Tile: ioilet Partitions: ink Deck: M Door Frame Paint: Vood Doors: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin | 12x24 |
| loor: loor Base: Vall Paint: ieiling: V. Toilet 207 & M. Toilet 209: loor Tile: loor Cove Transition: Vall Tile: Oilet Partitions: ink Deck: M Door Frame Paint: Vood Doors: ieiling: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 | 12x24 |
| loor: loor Base: Vall Paint: Seiling: V. Toilet 207 & M. Toilet 209: loor Tile: loor Cove Transition: Vall Tile: vall Tile: vall Tile: ink Deck: M Door Frame Paint: Vood Doors: Seiling: anitor's Closet 208: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries Armstrong | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak ACP | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 Calla - White | 12x24 3x12" stacked bond |
| loor: loor Base: vall Paint: ieiling: V. Toilet 207 & M. Toilet 209: loor Tile: loor Cove Transition: Vall Tile: oilet Partitions: ink Deck: M Door Frame Paint: Vood Doors: ieiling: anitor's Closet 208; loor Tile and Base: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries Armstrong Daltile | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak ACP | Railcar 00700 Black Brown SW7042 Shoji White Calla SV31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 Calla - White SY31 Beige | 12x24 |
| Floor: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries Armstrong Daltile Marlite | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak ACP | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 Calla - White SY31 Beige 199 Bright White | 12x24 3x12" stacked bond |
| Floor: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries Armstrong Daltile Daltile Marite Sherwin Williams | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak ACP Synchronic Standard FRP - Pebbled | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 Calla - White SY31 Beige 199 Bright White SW 707 Ceiling Bright White | 12x24 3x12" stacked bond |
| Presidents 206: Floor: Floor Base: Vall Paint: Ceiling: N. Tollet 207 & M. Tollet 209: Floor Tile: Floor Cove Transition: Vall Tile: Toilet Partitions: Sink Deck: M Door Frame Paint: Wood Doors: Ceiling: Janitor's Closet 208: Floor Tile and Base: FRP Wall Protection: Wall Point (Above FRP): Ceiling: | Mannington Sherwin Williams Armstrong Daltile Schulter Marazzi Scranton Bradley Sherwin Williams VT Industries Armstrong Daltile Marlite | Suburban Abstract Edge Effects Sculptured Wall Base - 3" Flair ACP Synchronic Dilex - EHK Zellige Neo Omni Deck - Terreon Architectural Wood Doors: White Oak ACP | Railcar 00700 Black Brown SW7042 Shoji White Calla SY31 Beige Stainless Steel ZL11 Gesso Shale - Orange Peel Texture Glacier SW 7675 Sealskin Mocha, MA24 Calla - White SY31 Beige 199 Bright White | 12x24 3x12" stacked bond |

| Finish Schedule - Exterior | | | | |
|--|----------------------------------|--|--------------------------------------|--|
| | | | | |
| General Exterior Finishes: | | | | |
| Brick: | Belden | Modular Canyon Full Range Finish | | |
| Mortar: | | color to be determined | | |
| Fiber Cement Panel | Equitone | Natura | N961 | |
| Exterior Coping (over fibercement panel & adhered stone) | | color to be determined | | |
| Aluminum Plank Siding | Longboard Architectural Products | 6" Horizontal, Tounge and Groove Woodgrains #2 | Table Walnut | |
| Exterior Coping (roof edge @ aluminum plank) | | color to be determined | | |
| Adhered Manufactured Stone | Eldorado Stone | Shadow Rock | Chesapeake | |
| Curtain Wall | Kawneer | | Dark Bronze | |
| Aluminum Window Systems | Kawneer | | Dark Bronze | |
| Aluminum Storefront Systems | Kawneer | | Dark Bronze | |
| Louvers | | | Dark Bronze | |
| Exterior Man Doors (Paint): | Sherwin Williams | | SW7675 Sealskin | |
| Garage Doors (Base Bid & Alt.) | | | RAL3013 - Tomato Red ** Custom Color | |
| Exterior Signage Halo Lit | | | Brushed Aluminum | |
| Exterior Signage Pin Mounted (non-illuminated) | | | Dark Bronze | |
| | | | | |
| | | | | |



REINFORCING DETAILS

GENERAL NOTES:

- DRAINAGE STRUCTURES SHALL BE CAST IN PLACE OR PRECAST UNITS. ROUND DRAINAGE STRUCTURES SHALL BE PRECAST ONLY. ALL CAST IN PLACE CONCRETE SHALL BE CLASS A. THE CONTRACTORS SHALL SUBMIT WORKING DRAWINGS FOR REVIEW AND APPROVAL OF AN TO THE STRUCTURES SHOWN ON THE STANDARD SHEETS OR CONTACT PLANS, OTHER MINOR CHANGES APPROVED BY THE ENGINEER. USE OF FLAT SLAB TOPS ON ROUND UNITS SHALL REQUIRE SUBMISSION OF WORKING DRAWINGS.
- 2. SEE PLANS FOR ELEVATIONS, DRAINAGE STRUCTURE LOCATIONS, TYPE OF GRATE UTILIZED, LOCATION OF SCOOPS, FORMED INVERTS, SUMPS AND DRAINS.
- REINFORCEMENT FOR RECTANGULAR DRAINAGE UNITS (CAST IN PLACE OR PRECAST) B REINFORCEMENT INDICATED FOR RECTANGULAR TOP SLABS, RISERS AND BASES SHALL GRADE 60. WIRE FABRIC FOR CONCRETE REINFORCEMENT SHALL MEET THE REQUIREM §709-02. RISER REINFORCEMENT SHALL BE PLACED SO IT WILL HAVE A MINIMUM CO 2" BUT NO MORE THAN 4" FROM THE INSIDE FACE. THE REINFORCEMENT SHALL EXT COMPLETELY AROUND THE DRAINAGE STRUCTURE RISER AND SHALL BE LAPPED AND BASE REINFORCEMENT SHALL BE PLACED ABOVE THE MIDPOINT OF SLAB AND SHALL MINIMUM CONCRETE COVER OF 2".
- 4. ROUND ALTERNATIVE: WHEN SPECIFIED BY PAYMENT ITEM, THE CONTRACTOR MAY SUBSTITUTE ROUND, PREC DRAINAGE STRUCTURES IN PLACE OF RECTANGULAR STRUCTURES USING SIZES INDICA THE "SELECTION TABLE FOR ALTERNATE ROUND DRAINAGE STRUCTURES" ON SHEET THE RISER, TOP SLAB, AND BOTTOM SLAB FOR THE ROUND ALTERNATE SHALL BE MANUFACTURED IN ACCORDANCE WITH THE PROVISIONS OF §TOG-04 OF THE STANDARI SPECIFICATIONS. WORKING DRAWINGS FOR THE ROUND ALTERNATE SHALL BE SUBMIT THE ENGINEER FOR REVIEW AND APPROVAL, UNLESS THE ROUND ALTERNATE PROPOSE BEEN PREVIOUSLY APPROVED. FOR PREVIOUSLY APPROVED ROUND UNITS THE CONTRAC SHALL SUBMIT A COPY OF THE APPROVED DRAWINGS TO THE ENGINEER.
- 5. FORMED INVERTS:

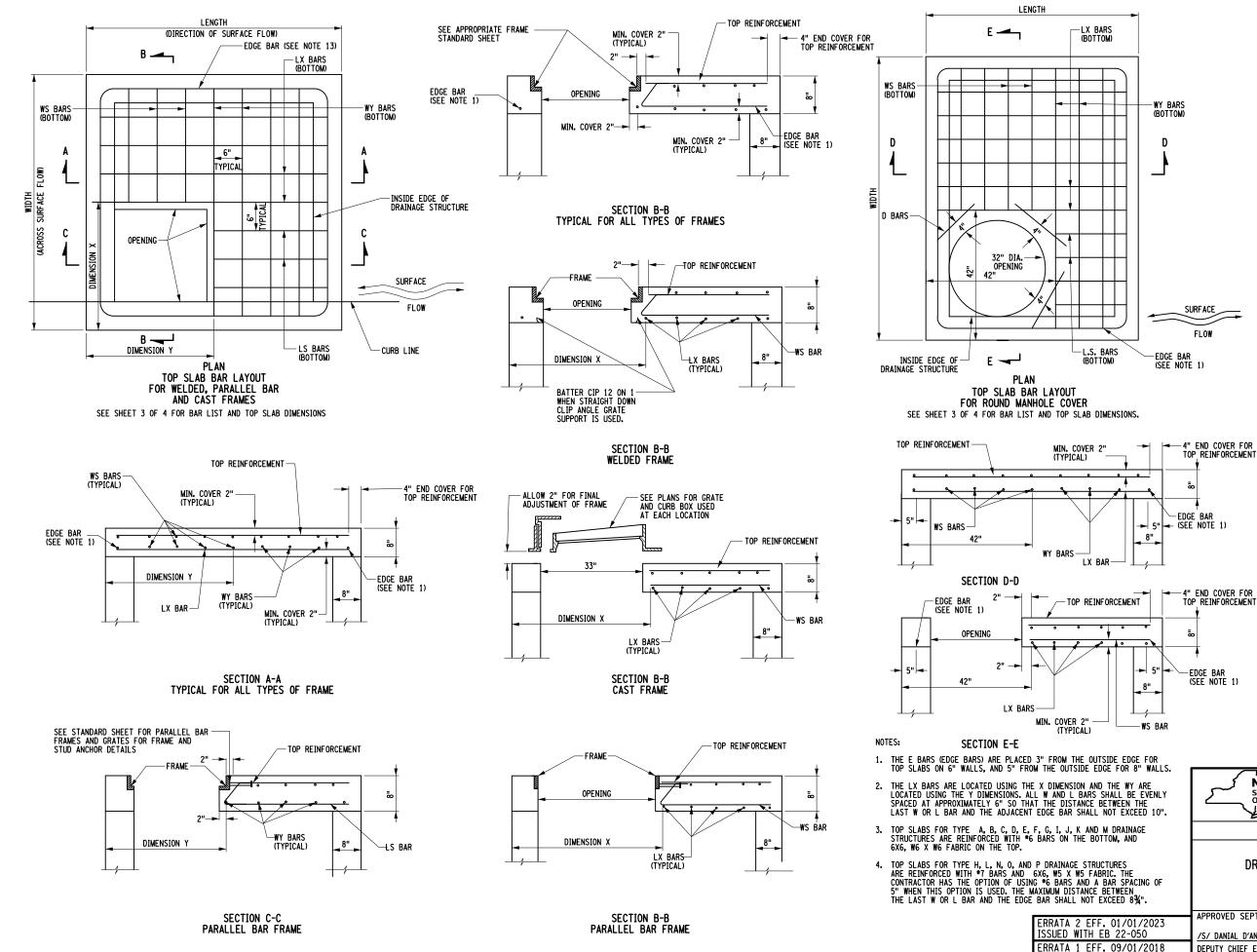
FORMED INVERTS, SCOOP AND SUMPS SHALL BE PROVIDED AND INCLUDED IN THE PR FOR DRAINAGE STRUCTURES CALLED FOR IN THE CONTRACT DOCUMENTS. WHEN NON PIPES ARE USED, THE FORMED INVERT AND SUMP DETAILS SHALL BE MODIFIED TO

- CAST FRAMES MAY HAVE EITHER RETICULINE OR PARALLEL BAR GRATES, AND WELDI FRAMES MAY HAVE EITHER RETICULINE OR RECTANGULAR GRATES. IF NO GRATE IS SPECIFIED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR MAY FURNISH EITHER T GRATES SHALL BE INSTALLED SO THAT THE LENGTH OF THE GRATE IS PARALLEL T SURFACE FLOW.
- WALL OPENINGS: RECTANGULAR DRAINAGE STRUCTURES SHOWN ON THESE STANDARD SHEETS SHOULD N HAVE CORNER PIPE ENTRIES. IF PIPE ALIGNMENT WOULD REQUIRE A CORNER ENTRY, ROUND DRAINAGE STRUCTURE OR USE A SPECIAL DRAINAGE STRUCTURE. ALL WALL O SHALL BE FORMED COMPLETELY THROUGH THE WALL SECTION. CIRCULAR WALL OPENI SHALL BE FORMED FOR EACH CIRCULAR PIPE ENTRING PERPENDICULAR TO THE WAL NON-CIRCULAR PIPES ARE SPECIFIED, OR ROUND PIPE ENTRIES ARE SKEWED, RECTAN OPENINGS MAY BE USED. THE CLEARANCE BETWEEN THE OUTSIDE OF THE PIPE AND OPENING SHALL BE AT LEAST 2" BUT NO MORE THAN 3". THIS CLEARANCE SHALL B MEASURED BETWEEN THE OUTSIDE OF THE PIPE AND NEAREST POINT ON THE RECTAN OPENING, IF A CORNER HAS PIPE ENTRIES ON BOTH SIDES, AND THERE IS LESS THA BETWEEN EITHER OPENING AND THE CORNER. THEN THAT SECTION OF THE DRAINAGE STRUCTURE MUST HAVE 8" THICK WALLS. WALL OPENINGS: STRUCTURE MUST HAVE 8" THICK WALLS.
- 8. MONOLITHIC AND INTEGRAL BASES MAY HAVE A MAXIMUM VERTICAL DRAFT OF 1/2" OF INTERIOR DIMENSIONS, TO FACILITATE FORM REMOVAL. FOR WALL OPENINGS THAT E THE FULL WIDTH OR LENGTH OF THE STRUCTURE, THE MINIMUM CLEARANCE BETWEE OUTSIDE OF THE PIPE AND THE WALL OPENING SHALL BE 11/2".
- FINISHING PIPE ENTRIES: FINISHING PIPE LATIRLES: THE BELLS OF CONCRETE PIPE SHALL BE CUT OFF AT EVERY PIPE ENTRY WHERE T ENTERS A STRUCTURE, CONNECTIONS BETWEEN THE STRUCTURE AND PIPE SHALL BE EITHER USING A RESILIENT CONNECTOR MEETING THE REQUIREMENTS OF ASTM C147 BY COMPLETELY FILLING THE SPACE AROUND EACH PIPE WITH CONCRETE GROUTING OR CONCRETE REPAIR MATERIAL. IN CASE OF LARGE SPACES AROUND PIPES, CONC PAVERS, COMPLETELY BEDDED IN GROUT OR CONCRETE REPAIR MATERIAL, MAY BE

| STRUCTUR | E SIZES | AND PAY | CODES |
|-------------------|---------|-------------------------|------------------------|
| STRUCTURE TYPE | | IDE NSIONS LENGTH | PAY ITEM XX CODE |
| A | 3'-0" | 3'-0" | 01 |
| В | 4'-0" | 3'-0" | 02 |
| C | 5′-0" | 3'-0" | 03 |
| D | 6′-8" | 3'-0" | 04 |
| E | 3′-0" | 4'-0" | 05 |
| F | 4'-0" | 4'-0" | 06 |
| G | 5′-0" | 4'-0" | 07 |
| Н | 6'-8" | 4'-0" | 08 |
| I | 3′-0" | 5'-0" | 09 |
| J | 4'-0" | 5'-0" | 10 |
| K | 5'-0" | 5'-0" | 11 |
| L | 6'-8" | 5'-0" | 12 |
| М | 3'-0" | 6'-8" | 13 |
| N | 4'-0" | 6'-8" | 14 |
| 0 | 5'-0" | 6'-8" | 15 |
| Р | 6'-8" | 6′-8" | 16 |

| IND DRAINAGE ALL BE CLASS A. T AL OF ANY CHANGES S, OTHER THAN N ROUND PRECAST GRATE RECAST) BAR SES SHALL BE REQUIREMENTS OF INIMUM COVER OF SHALL EXTEND PED AND TIED. ND SHALL HAVE A | не 10. | TOP SLAB A A MINIMUM AND PRECAS AND/OR FRA BEDDING MA MATERIALS TOP SLABS WITH A COM MATERIALS. GRATES OF CONCRETE (ADJUSTMENT WITH RECYC ELEMENTS. PRODUCTS A INSTALLED | IND OR FR. OF 1/2" OF TT TOP SL. MIES AND TERIAL ME OR CONCRE BINATION GRADE AD UP TO 1'- DR A COMB IS FOR FR LED RUBBI RECYCLED PPROVED 1 PER MANUF | AME AND GRATE ADJUS BEDDING SHALL BE PI BAS. GRADE ADJUSTMEI GRATES OF UP TO 2 ¹ / ₂ ETING THE REQUIREME TTE REPAIR MATERIAL. RAMES AND GRATES OF OF PRECAST CONCRETE JUSTMENT FOR TOP SL O" SHALL BE MADE WI INATION OF PRECAST (G MATERIALS ALTER MMES AND GRATES OF ER ELEMENTS OR UP TI RUBBER AND HDPE ELI SACTURER'S INSTRUCTIO | TMENT LACED BETWEEN RISERS VI FOR TOP SLABS "SHALL BE MADE WITH NTS OF CONCRETE GROUTING GRADE ADJUSTIMENT FOR UP TO 6"SHALL BE MADE PAVERS AND BEDDING ABS AND/OR FRAMES AND TH CAST-IN-PLACE CONCRETE ADJUSTMENT NATELY, GRADE UP TO 2" MAY BE MADE 0 3" WITH HDPE MENTS SHALL BE YEAU AND SHALL BE YEAU |
|--|---|--|--|---|--|
| UND. PRECAST | 11. | STEPS: | EPS SHAL | | . DRAINAGE STRUCTURES |
| IES INDICATED IN N SHEET 4 OF 4. ALL BE STANDARD BE SUBMITTED TO E PROPOSED HAS E CONTRACTOR N THE PRICES BID WHEN NON-CIRCULAR FIED TO FIT THE II | | ALLOWED OF ECCENTRIC THE USE OF DESIGN. THE REVIEW AND | AST DRAIN SPECIFIE CONICAL S SUCH DE CONTRAC APPROVAL R STRUCT TWEEN TH A CONICAL | IAGE SIRUCIUMES OR I D) MAY BE FITTED WIT ECTIONS TO REDUCE T VICES IS COMPATIBLE TOR SHALL SUBMIT WO OF FLAT SLAB REDUK | FLAT SLAB REDUCERS: MANHOLES (WHEN H CONCENTRIC OR HEIR DIAMETERS, PROVIDED WITH THE DRAINAGE SYSTEM RKING DRAWINGS FOR ZERS FOR ROUND OR I WITH A HEIGHT LESS T PIPE ENTRY AND THE AB REDUCER SHALL NOT |
| AND WELDED | | THE TOP OF | The uppi | | TOP OF THE RISER AND |
| RATE IS EITHER TYPE. RALLEL TO THE | | STRUCTURES WHEN SITE INSTALLED CONTRACT E | 5 DIVISION CONDITION TO A DEPT DOCUMENTS | BE SUBJECTED TO HIG FOR A SPECIAL DESIG S REQUIRE A DRAINAGE H GREATER THAN THA AN INSTALLATION TO | N. E STRUCTURE TO BE T SHOWN IN THE LERANCE OF 8" IS |
| SHOULD NEVER R ENTRY, USE A L WALL OPENINGS ALL OPENINGS D THE WALL. WHEN D, RECTANGULAR PIPE AND THE E SHALL BE HE RECTANGULAR LESS THAN 2" DRAINAGE | | OR REINFOR | WITHOUT H CING STEE ENT TABLE | L AS REQUIRED BY TH | EIN WALL THICKNESS E DRAINAGE STRUCTURE BERS: 14.30XXYY JUND OPTION ITEM 604.31XXYY JONCRETE CAP ITEM 604.32XXYY CTURE TYPE G WITH TYPE 6 M NUMBERS FOR STRUCTURE |
| OF ½" ON ALL S THAT EXTEND E BETWEEN THE | | | | | |
| WHERE THE BELL SHALL BE MADE BY | | | RAINAGE | STRUCTURE REINF | ORCEMENT |
| STALL DE MADE DI STM C1478 OR GROUTING MATERIAL | HEIGHT "A" | | | | T (SEE NOTE 3 AND 15) |
| ES, CONCRETE MAY BE USED. | UP TO 7'-0' | ' <u>6"</u> 8" | 6"X6"- | | AT 10" BOTH HORIZ. AND VERT. |
| | 7'-0" TO 14'- 14'-0" TO 21'- | 0" 8" 0" 8" | 6"X6"- | W8.5 X W8.5 OR *3 BA | RS AT 8" BOTH HORIZ. AND VERT. RS AT 5" BOTH HORIZ. AND VERT. |
| | | | | FLOOR SLAB REINFOR | CEMENT (SEE NOTE 3) |
| | UP TO 7'-0' 7'-0" TO 14'-0 14'-0" TO 21'- | 0" | 4"X4"- | W11 X W11 OR *3 BAF | RS AT 6" IN BOTH DIRECTIONS RS AT 4" IN BOTH DIRECTIONS RS AT 3" IN BOTH DIRECTIONS |
| | CURB, RECTANO THAN 2" ON E | GULAR STRUG | CTURES WI | TH ROUND MANHOLE OP | NRE SIZE S, T, AND U WITH ENING, OR IF THERE IS LESS UST HAVE 8" THICK WALLS. |
| FRAMES AND PA | | | | | |
| FRAME TYPE WELDED 3 WELDED 6 | PAY_ITEM YY CODE 03 06 | | | | OF NEW YORK OF TRANSPORTATION |
| WELDED 11 WELDED 16 | 11 16 | | | U.S. CUSTOMARY S | STANDARD SHEET |
| WELDED 22 MANHOLE 2'-8" CAST F1 CAST F2 CAST F3 RALLEL BAR 10PCB RALLEL BAR 11PCB RALLEL BAR 12PCB | 22 32 71 72 73 90 91 92 | | | RAINAGE STRUC (SHEET | 1 OF 4) |
| | | | | IOVEMBER 28, 2012 | ISSUED UNDER EB 12-044 |
| | | | | W. LEE, P.E. | |





| TABLE OF "X" AND "Y" DIMENSIONS | | | | | | | |
|------------------------------------|----------------|-----------------------|--|--|--|--|--|
| | 8" THIO | CK WALLS | | | | | |
| FRAME NO. | DIMENSION X | DIMENSION Y | | | | | |
| | WELDED F | RAMES | | | | | |
| 3 | 2′-5" | 3'-61/2" | | | | | |
| 6 | 2'-71/2" | 2'-81/2" | | | | | |
| 11 | 2'-10" | 3′-61⁄2" | | | | | |
| 16 | 3′-01⁄2" | 4'-4 /2" | | | | | |
| 22 | 3'-8" | 3'-111/2" | | | | | |
| | CAST IRON | FRAMES | | | | | |
| F1 | 3′-7" | 3'-2" | | | | | |
| F2 | 3′-7" | 4'-0" | | | | | |
| F3 | 3′-7" | 4'-10" | | | | | |
| Р | ARALLEL BA | R FRAMES | | | | | |
| 1 OPCB | 2'-10" | 3′-6 /2" | | | | | |
| 11PCB | 3'-01/2" | 4'-41/2" | | | | | |
| 12PCB | 3′-8" | 3'-111/2" | | | | | |

| OUTSIDE FRAME DIMENSIONS | | | | | | | | |
|-----------------------------|--------------------------|----------------------------|--|--|--|--|--|--|
| FRAME NO. | WIDTH | LENGTH | | | | | | |
| 3 | 1′-11 ¹⁵ //6" | 3′-1½" | | | | | | |
| 6 | 2′-27/ ₁₆ " | 2'-31/2" | | | | | | |
| 11 | 2′-4 ¹⁵ ⁄16" | 3'-11/2" | | | | | | |
| 16 | 2′-77/ ₁₆ " | 3′-11½" | | | | | | |
| 22 | 3′-2 ¹⁵ /16" | 3′-61⁄2" | | | | | | |
| 1 OPCB | 2′-01⁄8" | 3'-21/2" | | | | | | |
| 11PCB | 2′-3¾" | 4'-0 <mark>//</mark> 2" | | | | | | |
| 12PCB | 2'-101/8" | 3′-71/2" | | | | | | |
| F1 | 3'-31⁄4" MIN. | 2'-11" MIN. | | | | | | |
| F2 | 3'-31/4" MIN. | 3'-9 ¹ /4" MIN. | | | | | | |
| F3 | 3'-31⁄4" MIN. | 4'-7 ¹ /4" MIN. | | | | | | |

ISSUED WITH EB 1

| WS BAR | | |
|---|--------------------------------------|---------------------------------|
| E EDGE FOR FOR 8" WALLS. E WY ARE L BE EVENLY IEEN THE EXCEED 10". | NEW YORK STATE OF OPPORTUNITY. | Department of Transportation |
| RAINAGE 1. AND | U.S. CUSTOMARY | STANDARD SHEET |
| RES THE SPACING OF WEEN ED 8%. | | UCTURE DETAILS 2 OF 4) |
| 1/01/2023 | APPROVED SEPTEMBER 19, 2008 | B ISSUED UNDER EB 08-036 |
| 22-050 | /S/ DANIAL D'ANGELO, P.E. | 604-02 |
| 9/01/2018 18-023 | DEPUTY CHIEF ENGINEER (DESIGN) | |
| | | |

| | | | | т | | | INFORC | | · | | | | |
|--------|-------|------------|------------------|------------|------------------|--------|------------------|------|------------------|-----|------------------|-----|----------------|
| STR. | FRAME | NO. | | I NO. | | NO. | | NO. | | N0. | | N0. | |
| TYPE | NO. | OF BARS | DESIG- NATION | OF BARS | DESIG- NATION | 0F | DESIG- NATION | I OF | DESIG- NATION | 0F | DESIG- NATION | 0F | DESIG NATIO |
| A | 3 | | | 3 | 6LX1 | 5 | 6WS2 | 1 | 6WY1 | 4 | 6E1 | | |
| В | 3 | | | 5 | 6LX1 | 5 | 6WS11 | 1 | 6WY3 | 2 | 6E3 | 2 | 6E1 |
| В | 11 | | | 4 | 6LX1 | 5 | 6WS7 | 1 | 6WY3 | 2 | 6E3 | 2 | 6E1 |
| С | 3 | | | 7 | 6LX1 | 5 | 6WS19 | 1 | 6WY5 | 2 | 6E5 | 2 | 6E1 |
| С | 11 | | | 6 | 6LX1 | 5 | 6WS15 | 1 | 6WY5 | 2 | 6E5 | 2 | 6E1 |
| D | 3 | | | 10 | 6LX1 | 5 | 6WS27 | 1 | 6WY7 | 2 | 6E7 | 2 | 6E1 |
| D | 11 | | | 9 | 6LX1 | 5 | 6WS23 | 1 | 6WY7 | 2 | 6E7 | 2 | 6E1 |
| Е | 3 | 3 | 6LS4 | 3 | 6LX3 | 5 | 6WS2 | 3 | 6WY1 | 2 | 6E1 | 2 | 6E3 |
| F | 3 | 3 | 6LS4 | 5 | 6LX3 | 5 | 6WS11 | 3 | 6WY3 | 4 | 6E3 | | |
| F | 6 | 3 | 6LS12 | 4 | 6LX3 | 3 | 6WS9 | 4 | 6WY3 | 4 | 6E3 | | |
| F | 11 | 3 | 6LS4 | 4 | 6LX3 | 5 | 6WS7 | 3 | 6WY3 | 4 | 6E3 | | |
| G | 3 | 3 | 6LS4 | 7 | 6LX3 | 5 | 6WS19 | 3 | 6WY5 | 2 | 6E5 | 2 | 6E3 |
| G | 6 | 3 | 6LS2 | 6 | 6LX3 | 3 | 6WS17 | 4 | 6WY5 | 2 | 6E5 | 2 | 6E3 |
| G | 11 | 3 | 6LS4 | 6 | 6LX3 | 5 | 6WS15 | 3 | 6WY5 | 2 | 6E5 | 2 | 6E3 |
| Н | 3 | 3 | 7LS4 | 10 | 7LX3 | 5 | 7WS27 | 3 | 7WY7 | 2 | 7E7 | 2 | 7E3 |
| Н | 6 | 3 | 7LS12 | 10 | 7LX3 | 3 | 7WS25 | 4 | 7WY7 | 2 | 7E7 | 2 | 7E3 |
| Н | 11 | 3 | 7LS4 | 9 | 7LX3 | 5 | 7WS23 | 3 | 7847 | 2 | 7E7 | 2 | 7E3 |
| I | 3 | 3 | 6LS14 | 3 | 6LX5 | 5 | 6WS2 | 5 | 6WY1 | 2 | 6E1 | 2 | 6E5 |
| J | 3 | 3 | 6LS14 | 5 | 6LX5 | 5 | 6WS11 | 5 | 6WY3 | 2 | 6E3 | 2 | 6E5 |
| J | 6 | 3 | 6LS19 | 4 | 6LX5 | 3 | 6WS9 | 6 | 6WY3 | 2 | 6E3 | 2 | 6E5 |
| J | 11 | 3 | 6LS14 | 4 | 6LX5 | 5 | 6WS7 | 5 | 6WY3 | 2 | 6E3 | 2 | 6E5 |
| J | 16 | 4 | 6LS5 | 4 | 6LX5 | 7 | 6WS5 | 3 | 6WY3 | 2 | 6E3 | 2 | 6E5 |
| ĸ | 3 | 3 | 6LS14 | 7 | 6LX5 | 5 | 6WS19 | 5 | 6WY5 | 4 | 6E5 | ~ | 020 |
| ĸ | 6 | 3 | 6LS19 | 6 | 6LX5 | 3 | 6WS17 | 6 | 6WY5 | 4 | 6E5 | | |
| ĸ | 11 | 3 | 6LS14 | 6 | 6LX5 | 5 | 6WS15 | 5 | 6WY5 | 4 | 6E5 | | |
| ĸ | 16 | 4 | 6LS5 | 6 | 6LX5 | 7 | 6WS13 | 3 | 6WY5 | 4 | 6E5 | | |
| K | 22 | 5 | 6LS9 | 4 | 6LX5 | 6 | 6WS8 | 4 | 6WY5 | 4 | 6E5 | | |
| Ľ | 3 | 3 | 7LS14 | 10 | 7LX5 | 5 | 7WS27 | 5 | 7WY7 | 2 | 7E7 | 2 | 7E5 |
| L | 6 | 3 | 7LS19 | 10 | 7LX5 | 3 | 7₩525 | 6 | 7897 | 2 | 7E7 | 2 | 7E5 |
| L | 11 | 3 | 7LS14 | 9 | 7LX5 | 5 | 7WS23 | 5 | 7847 | 2 | 7E7 | 2 | 7E5 |
| L | 16 | 4 | 7LS5 | 9 | 7LX5 | 7 | 7WS21 | 3 | 7897 | 2 | 7E7 | 2 | 7E5 |
| L | 22 | 5 | 7LS9 | 8 | 7LX5 | 6 | 7WS19 | 4 | 7897 | 2 | 7E7 | 2 | 7E5 |
| M | 3 | э 3 | 6LS25 | 3 | 6LX7 | 5 | 6WS2 | 8 | 6WY1 | 2 | 6E1 | 2 | 6E7 |
| N | 3 | 3 | 7LS25 | 5 | 7LX7 | 5 | 7WS8 | 8 | 7WY3 | 2 | 7E3 | 2 | 7E7 |
| N | 6 | 3 | 7LS30 | 4 | 7LX7 | 3 | 7WS6 | 10 | 7WY3 | 2 | 7E3 | 2 | 7E7 |
| N | 11 | 3 | 7LS25 | 3 | 7LX7 | 5 | 7WS4 | 8 | 7WY3 | 2 | 7E3 | 2 | 7E7 |
| N | 16 | 4 | 7LS25 | 4 | 7LX7 | 7 | 7WS4 7WS3 | 6 | 7WY3 | 2 | 7E3 | 2 | 7E7 |
| N 0 | 3 | 4 | 7LS25 | 4 | 7LX7 | 5 | 7WS16 | 8 | 7WY5 | 2 | 7E5 | 2 | 7E7 |
| 0 | 6 | 3 | 7LS25 | | 7LX7 | э 3 | 7WS16 7WS14 | 10 | 7WY5 | | 7E5 | | 7E7 |
| 0 | 11 | 3 | 7LS25 | 6 | 7LX7 | э 5 | 7WS14 7WS12 | 8 | 7WY5 | 2 | 7E5 | 2 | 7E7 |
| 0 | 16 | 3 4 | 7LS25 7LS19 | 6 | 7LX7 | 5 7 | | 6 | 7WY5 | 2 | 7E5 | 2 | 7E7 |
| 0 | 22 | 4 | 7LS19 | 4 | 7LX7 | 6 | 7WS10 7WS5 | 7 | 7WY5 | | 7E5 | | 7E7 |
| P | 22 | э 3 | | 10 | | - | | - | 71115 | 2 | | 2 | 151 |
| P P | - | 3 3 | 7LS25 | | 7LX7 7LX7 | 5 | 7WS27 | 8 | 7007 | 4 | 7E7 | | |
| | 6 | - | 7LS30 | 10 | | 3 | 7WS25 | 10 | | 4 | 7E7 | | |
| P | 11 | 3 | 7LS25 | 9 | 7LX7 | 5 | 7WS23 | 8 | 7WY7 | 4 | 7E7 | | |
| P | 16 | 4 | 7LS19 | 9 | 7LX7 | 7 | 7WS21 | 6 | 7WY7 | 4 | 7E7 | | |
| Ρ | 22 | 5 | 7LS22 | 8 | 7LX7 | 6 | 7WS19 | 7 | 7WY7 | 4 | 7E7 | | |

| | BOTTOM REINFORCEMENT | | | | | | | | | | | | | |
|--------------|--|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|-----------------|
| | TOP SLAB WITH ROUND CAST MANHOLE FRAME | | | | | | | | | | | | | |
| STR. TYPE | NO. OF BARS | DESIG- NATION | NO. OF BARS | DESIG- NATION | NO. OF BARS | DESIG- NATION | NO. OF BARS | DESIG- NATION | NO. OF BARS | DESIG- NATION | NO. OF BARS | DESIG- NATION | NO. OF BARS | DESIG- NATIO |
| A | | | 1 | 6LX1 | | | 1 | 6WY1 | 3 | 6D1 | 4 | 6E1 | | |
| В | | | 3 | 6LX1 | 5 | 6WS2 | 1 | 6WY3 | 3 | 6D1 | 2 | 6E3 | 2 | 6E1 |
| С | | | 5 | 6LX1 | 5 | 6WS10 | 1 | 6WY5 | 3 | 6D1 | 2 | 6E5 | 2 | 6E1 |
| D | | | 8 | 6LX1 | 5 | 6WS21 | 1 | 6WY7 | 3 | 6D1 | 2 | 6E7 | 2 | 6E1 |
| E | 5 | 6LS4 | 1 | 6LX3 | | | 3 | 6WY1 | 3 | 6D1 | 2 | 6E1 | 2 | 6E3 |
| F | 5 | 6LS4 | 3 | 6LX3 | 5 | 6WS2 | 3 | 6WY3 | 3 | 6D1 | 4 | 6E3 | | |
| G | 5 | 6LS4 | 5 | 6LX3 | 5 | 6WS10 | 3 | 6WY5 | 3 | 6D1 | 2 | 6E5 | 2 | 6E3 |
| H | 5 | 7LS4 | 8 | 7LX3 | 5 | 7WS20 | 3 | 7WY7 | 3 | 6D1 | 2 | 7E7 | 2 | 7E3 |
| Ι | 5 | 6LS14 | 1 | 6LX5 | | | 5 | 6WY1 | 3 | 6D1 | 2 | 6E1 | 2 | 6E5 |
| J | 5 | 6LS14 | 3 | 6LX5 | 5 | 6WS6 | 5 | 6WY3 | 3 | 6D1 | 2 | 6E3 | 2 | 6E5 |
| K | 5 | 6LS14 | 5 | 6LX5 | 5 | 6WS7 | 5 | 6WY5 | 3 | 6D1 | 4 | 6E5 | | |
| L | 5 | 7LS14 | 8 | 7LX5 | 5 | 7WS20 | 5 | 7WY7 | 3 | 6D1 | 2 | 7E7 | 2 | 7E5 |
| М | 5 | 6LS25 | 1 | 6LX7 | | | 8 | 6WY1 | 3 | 6D1 | 2 | 6E1 | 2 | 6E7 |
| Ν | 5 | 7LS25 | 3 | 7LX7 | 5 | 7WS2 | 8 | 7WY3 | 3 | 6D1 | 2 | 7E3 | 2 | 7E7 |
| 0 | 5 | 7LS25 | 5 | 7LX7 | 5 | 7WS7 | 8 | 7WY5 | 3 | 6D1 | 2 | 7E5 | 2 | 7E7 |
| Ρ | 5 | 7LS25 | 8 | 7LX7 | 5 | 7WS20 | 8 | 7WY7 | 3 | 6D1 | 4 | 7E7 | | |

| TOP SLAB DIMENSIONS | | | | | | | | |
|---------------------|---------|---------|---------|---------|----------------------|--|--|--|
| STRUCTURE | 6" THIC | K WALLS | 8" THIC | K WALLS | TOP REINFORCEMENT | | | |
| TYPE | WIDTH | LENGTH | WIDTH | LENGTH | (NOTES 3 AND 4) | | | |
| Α | 4'-0" | 4'-0" | 4'-4" | 4'-4" | 6" X 6" W4 X W4 | | | |
| В | 5′-0" | 4'-0" | 5′-4" | 4'-4" | 6" X 6" W4 X W4 | | | |
| C | 6′-0" | 4'-0" | 6'-4" | 4'-4" | 6" X 6" W4 X W4 | | | |
| D | 7′-8" | 4'-0" | 8'-0" | 4'-4" | 6" X 6" W4 X W4 | | | |
| E | 4'-0" | 5′-0" | 4'-4" | 5′-4" | 6" X 6" W4 X W4 | | | |
| F | 5′-0" | 5'-0" | 5′-4" | 5′-4" | 6" X 6" W4 X W4 | | | |
| G | 6'-0" | 5'-0" | 6'-4" | 5′-4" | 6" X 6" W4 X W4 | | | |
| н | 7′-8" | 5′-0" | 8'-0" | 5'-4" | 6" X 6" W5 X W5 | | | |
| I | 4'-0" | 6'-0" | 4'-4" | 6′-4" | 6" X 6" W4 X W4 | | | |
| J | 5′-0" | 6'-0" | 5′-4" | 6′-4" | 6" X 6" W4 X W4 | | | |
| K | 6'-0" | 6'-0" | 6'-4" | 6′-4" | 6" X 6" W4 X W4 | | | |
| L | 7′-8" | 6'-0" | 8'-0" | 6′-4" | 6" X 6" W5 X W5 | | | |
| М | 4'-0" | 7′-8" | 4'-4" | 8'-0" | 6" X 6" W5 X W5 | | | |
| N | 5′-0" | 7′-8" | 5′-4" | 8'-0" | 6" X 6" W5 X W5 | | | |
| 0 | 6′-0" | 7′-8" | 6'-4" | 8'-0" | 6" X 6" W5 X W5 | | | |
| Р | 7′-8" | 7′-8" | 8'-0" | 8'-0" | 6" X 6" W5 X W5 | | | |

BOTTOM REINFORCEMENT TOP SLAB WITH PARALLEL BAR FRAME

 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H
 H

L 10PCB 4 7LS14 10 7LX5 5 7WS23 5 7WY7 2 7E7 2 7E5 L 12PCB 6 7LS9 8 7LX5 6 7WS19 4 7WY7 2 7E7 2 7E5 M 12PCB 6 7LS22 1 7LX7 7 6WY1 2 6E1 2 7E7

 M
 12PCB
 6
 7LS22
 1
 7LX1
 7
 6WY1
 2
 6E1
 2
 7E7

 N
 10PCB
 4
 7LS25
 4
 7LX7
 5
 7WS4
 8
 7WY3
 2
 7E3
 2
 7E7

 N
 11PCB
 4
 7LS19
 4
 7LX7
 7
 7WS3
 6
 7WY3
 2
 7E3
 2
 7E7

 0
 10PCB
 4
 7LS25
 6
 7LX7
 5
 7WS12
 8
 7WY5
 2
 7E5
 2
 7E7

 0
 10PCB
 4
 7LS19
 6
 7LX7
 7
 7WS12
 8
 7WY5
 2
 7E5
 2
 7E7

 0
 11PCB
 4
 7LS19
 6
 7LX7
 7
 7WS10
 6
 7WY5
 2
 7E5
 2
 7E7

 0
 12PCB
 6
 7LS22
 5
 7LX7
 6
 7WS5
 7
 7WY5
 2
 <td

BOTTOM REINFORCEMENT

TOP SLAB WITH CAST FRAME STR. FRAME NO. DESIG- NO. DESIG- OF NO. DESIG- OF NO. DESIG- OF NATION BARS NA

 G
 F1
 5
 6LS7
 5
 6LX3
 4
 6WS9
 4
 6WY5
 2
 6E5
 2
 6E3

 G
 F3
 5
 6LX3
 8
 6WS9
 2
 6E5
 2
 6E3

 G
 F3
 5
 6LX3
 8
 6WS9
 2
 6E5
 2
 6E3

 H
 F1
 5
 7LS7
 8
 7LX3
 4
 7WS19
 4
 7WY7
 2
 7E7
 2
 7E3

 J
 F1
 5
 6LS16
 3
 6LX5
 4
 6WS1
 5
 6WY3
 2
 6E3
 2
 6E5

 J
 F2
 5
 6LS8
 3
 6LX5
 6
 6WS1
 4
 6WY3
 2
 6E3
 2
 6E5

 J
 F2
 5
 6LS8
 3
 6LX5
 6
 6WS1
 4
 6WY3
 2
 6E3
 2
 6E5

 L
 F1
 5
 7LS16
 8
 7LX5
 4
 7WS19
 5
 7WY7
 2
 7E7
 2
 7E5

 L
 F2
 5
 7LS8
 8
 7LX5
 6
 7WS19
 4
 7WY7
 2
 7E7
 2
 7E5

N F1 5 7LS27 3 7LX7 4 7WS2 9 7WY3 2 7E3 2 7E7
 N
 F2
 5
 7LS21
 3
 7LX7
 6
 7WS2
 7
 7WY3
 2
 7E3
 2
 7E7

 N
 F3
 5
 7LS16
 3
 7LX7
 8
 7WS2
 6
 7WY3
 2
 7E3
 2
 7E7

 0
 F1
 5
 7LS27
 5
 7LX7
 4
 7WS6
 9
 7WY5
 2
 7E5
 2
 7E7

 0
 F2
 5
 7LS21
 5
 7LX7
 6
 7WS6
 7
 7WY5
 2
 7E5
 2
 7E7
 0 F3 5 7LS16 5 7LX7 8 7WS6 6 7WY5 2 7E5 2 7E7

K 10PCB 4 6LS14 6 6LX5 5 6WS15 5 6WY5 4 6E5 K 12PCB 6 6LS9 5 6LX5 6 6WS8 4 6WY5 4 6E5

P 10PCB 4 7LS25 10 7LX7 5 7WS23 8 7WY7 4 7E7 P 11PCB 5 7LS19 9 7LX7 7 7WS21 6 7WY7 4 7E7 P 12PCB 4 7LS22 8 7LX7 6 7WS19 7 7WY7 4 7E7

 F
 F1
 5
 6LS7
 3
 6LX3
 4
 6WS2
 4
 6WY3
 4
 6E3

 F
 F3
 3
 6LX3
 8
 6WS2
 4
 6W3
 4
 6E3

 K
 F1
 5
 6LS16
 5
 6LX5
 4
 6WS9
 5
 6WY5
 4
 6E5

 K
 F2
 5
 6LS8
 5
 6LX5
 6
 6WS9
 4
 6WY5
 4
 6E5

 P
 F1
 5
 7LS27
 8
 7LX7
 4
 7WS19
 9
 7WY7
 4
 7E7

 P
 F2
 5
 7LS21
 8
 7LX7
 6
 7WS19
 7
 7WY7
 4
 7E7

P F3 5 7LS16 8 7LX7 8 7WS19 6 7WY7 4 7E7

STR. FRAME NO. DESIG-TYPE NO. BARS

F 11PCB

G 11PCB

NO. DESIG-OF NATION BARS NATION BARS NATION BARS NATION BARS

6 6LX3 7 6WS13 1 6WY5 2 6E5 2 6E3

4 6LX3 7 6WS5 1 6WY3 4 6E3

| | | | DAD | LIST | | | |
|---------------------|--------|------|--------------------------|---------------------|-----------------|----------|----------------------|
| DECIONATION | LENGTH | SIZE | DESCRIPTION | | LENGTH | SIZE | DESCRIPTION |
| DESIGNATION 6LS4 | 1'-6" | *6 | SHORT L BAR | DESIGNATION 7LS4 | 1'-6" | #7 | SHORT L BAR |
| 6L34 6LS5 | 1'-7" | *6 | SHORT L BAR | 7L34 7LS5 | 1'-7" | #7 | SHORT L BAR |
| 6L33 6LS7 | 1'-9" | *6 | SHORT L BAR | 7LS5 7LS7 | 1'-9" | #7 | SHORT L BAR |
| 6LS8 | 1'-11" | *6 | SHORT L BAR | 7LS7 | 1'-9" | #7 | SHORT L BAR |
| 6LS9 | 2'-0" | *6 | SHORT L BAR | 7LS9 | 2'-0" | #7 | SHORT L BAR |
| 6L39 6LS12 | 2'-3" | *6 | SHORT L BAR | 7LS12 | 2'-0 | #7 | SHORT L BAR |
| 6LS12 | 2'-5" | *6 | SHORT L BAR | 7LS12 | 2'-5" | #7 | SHORT L BAR |
| 6LS14 6LS16 | 2'-9" | *6 | SHORT L BAR | 7LS14 | 2'-9" | #7 | SHORT L BAR |
| 6LS18 | 2 - 3 | *6 | SHORT L BAR | 7LS18 | 2 - 9 3'-3" | *7 | SHORT L BAR |
| 6LS25 | 4'-0" | *6 | SHORT L BAR | 7LS21 | 3'-7" | #7 | SHORT L BAR |
| 6LX1 | 3'-6" | *6 | | 7LS21 | 3'-8" | #7 | SHORT L BAR |
| 6LX3 | 4'-6" | *6 | LONG L BAR LONG L BAR | 7LS25 | 4'-1" | #7 | SHORT L BAR |
| 6LX5 | 5'-6" | *6 | LONG L BAR | 7LS23 | 4'-5" | *7 | SHORT L BAR |
| 6LX7 | 7'-2" | *6 | LONG L BAR | 7LS30 | 4-5 | #7 | SHORT L BAR |
| 6WS1 | 1'-4" | *6 | SHORT W BAR | 7LX3 | 4'-6" | +7 | LONG L BAR |
| 6WS2 | 1'-6" | *6 | SHORT W BAR | 7LX5 | 6'-5" | *7 | LONG L BAR |
| 6WS5 | 1'-11" | *6 | SHORT W BAR | 7LX7 | 7'-2" | *7 | LONG L BAR |
| 6WS7 | 2'-2" | *6 | SHORT W BAR | 7852 | 1'-5" | *7 | SHORT W BAR |
| 6WS8 | 2'-3" | *6 | SHORT W BAR | 7WS3 | 1'-11" | #7 | SHORT W BAR |
| 6WS9 | 2'-4" | *6 | SHORT W BAR | 7WS4 | 2'-1" | *7 | SHORT W BAR |
| 6WS10 | 2'-5" | *6 | SHORT W BAR | 7WS5 | 2'-3" | #7 | SHORT W BAR |
| 6WS11 | 2'-7" | *6 | SHORT W BAR | 7WS6 | 2'-4" | *7 | SHORT W BAR |
| 6WS13 | 2'-11" | *6 | SHORT W BAR | 7WS7 | 2'-5" | ¥7 | SHORT W BAR |
| 6WS15 | 3'-2" | *6 | SHORT W BAR | 7WS8 | 2'-7" | #7 | SHORT W BAR |
| 6WS17 | 3'-4" | *6 | SHORT W BAR | 7WS10 | 2'-11" | #7 | SHORT W BAR |
| 6WS19 | 3'-7" | *6 | SHORT W BAR | 7WS12 | 3'-2" | #7 | SHORT W BAR |
| 6WS21 | 4'-1" | *6 | SHORT W BAR | 7WS14 | 3'-4" | ¥7 | SHORT W BAR |
| 6WS23 | 4'-10" | *6 | SHORT W BAR | 7WS16 | 3'-6" | #7 | SHORT W BAR |
| 6WS27 | 5′-3" | *6 | SHORT W BAR | 7WS19 | 4'-0" | #7 | SHORT W BAR |
| 6WY1 | 3′-6" | *6 | LONG W BAR | 7WS20 | 4'-1" | #7 | SHORT W BAR |
| 6WY3 | 4'-6" | *6 | LONG W BAR | 7WS21 | 4'-7" | #7 | SHORT W BAR |
| 6WY5 | 5′-6" | *6 | LONG W BAR | 7WS23 | 4'-10" | #7 | SHORT W BAR |
| 6WY7 | 7′-2" | *6 | LONG W BAR | 7WS25 | 5′-0" | #7 | SHORT W BAR |
| 6D1 | 1'-6" | *6 | DIAGONAL BAR | 7WS27 | 5'-3" | #7 | SHORT W BAR |
| 6E1 | 3'-3%" | *6 | EDGE BAR | 7WY3 | 4'-6" | #7 | LONG W BAR |
| 6E3 | 4'-3% | *6 | EDGE BAR | 7WY5 | 5'-6" | #7 #7 | LONG W BAR |
| 6E5 | 5'-33% | *6 | EDGE BAR | 7WY7 | 7'-2" | #7 #7 | LONG W BAR |
| 6E7 | 6'-4¾" | *6 | EDGE BAR | 7E3 | 4'-3" | #7 #7 | EDGE BAR |
| L | | | | 7E5 | 5′-3" 6′-11" | #7 #7 | EDGE BAR EDGE BAR |
| | | | | 7E7 | 0-11 | " | EDGE DAR |

| R | = | 21⁄4" | |
|---|---|-------|--|
| | | | |

LENGTH

TYPICAL EDGE BAR

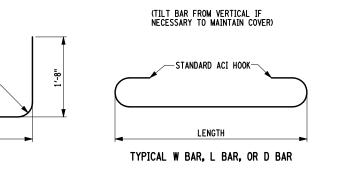
TOP SLAB REINFORCEMENT NOTES:

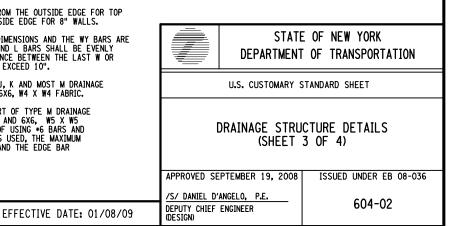
- 1. THE E BARS (EDGE BARS) ARE PLACED 3" FROM THE OUTSIDE EDGE FOR TOP SLABS ON 6" WALLS, AND 5: FROM THE OUTSIDE EDGE FOR 8" WALLS.
- 2. THE LX BARS ARE LOCATED USING THE X DIMENSIONS AND THE WY BARS ARE LOCATED USING THE Y DIMENSIONS. ALL W AND L BARS SHALL BE EVENLY SPACED AT APPROX. 6". SO THAT THE DISTANCE BETWEEN THE LAST W OR L BAR AND ADJACENT EDGE BAR SHALL NOT EXCEED 10".
- 3. TOP SLABS FOR TYPE A, B, C, D, F, G, I, J, K AND MOST M DRAINAGE STRUCTURES ARE REINFORCED WITH •6 AND 6X6, W4 X W4 FABRIC.
- 4. TOP SLABS FOR TYPE H, L, N, O, P AND PART OF TYPE M DRAINAGE STRUCTURES ARE REINFORCED WITH *7 BARS AND 6X6, W5 X W5 FABRIC. THE CONTRACTOR HAS THE OPTION OF USING *6 BARS AND A BAR SPACING OF 5". WHEN THIS OPTION IS USED, THE MAXIMUM DISTANCE BETWEEN THE LAST W OR L BAR AND THE EDGE BAR SHALL NOT EXCEED 9"

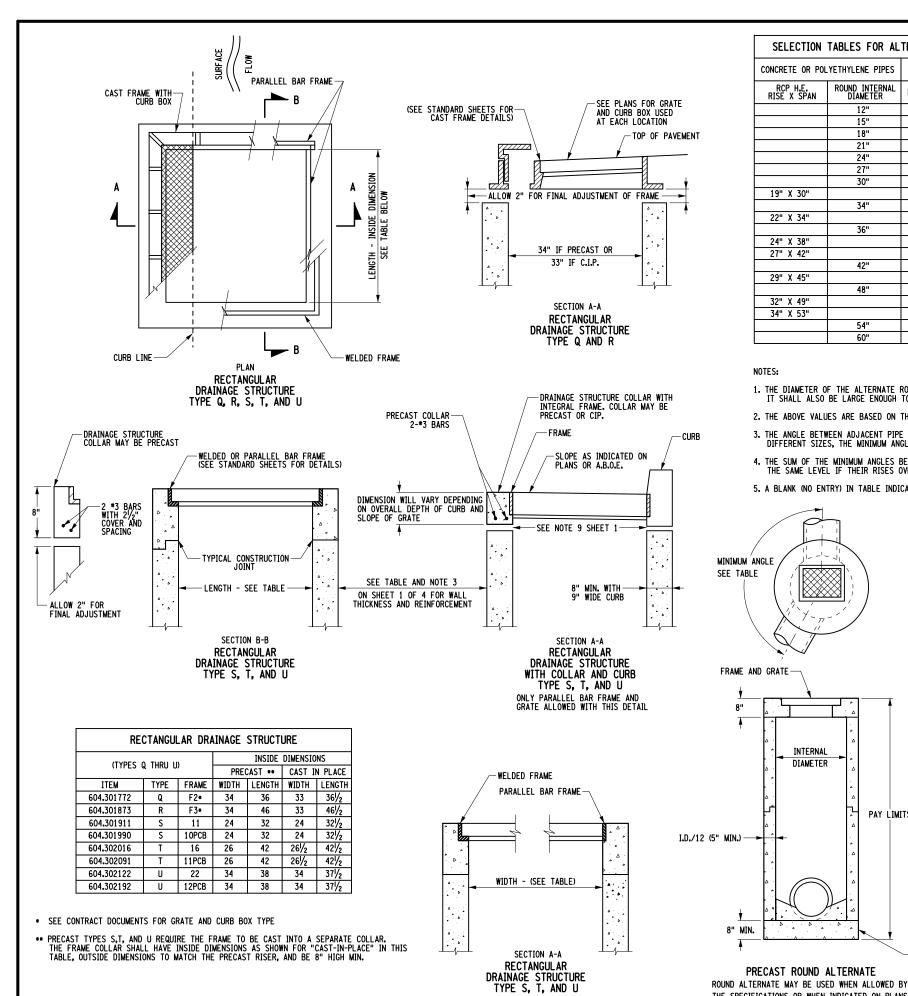
January 01 SHEETS, STANDARD

2023

020 _PWP:d0109553\604-J-NOV-2008 14:03 urley = IP_P = 20-N = itur] FILE NAME DATE/TIME USER



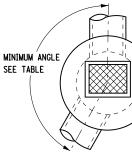




| SELECTION | TABLES FOR AL | TERNATE | ROUND | DRAINAGE | STRUC | TURES |
|-------------------------|----------------------------|---------|-----------------|-------------------|-----------------|----------|
| CONCRETE OR PO | LYETHYLENE PIPES | 48" | STRUCTUR 60" | E INTERNAL 72" | DIAMETER 84" | ≀ 96" |
| RCP H.E. RISE X SPAN | ROUND INTERNAL DIAMETER | MINIMUM | ANGLE BE | TWEEN PIPE | ENTRIES | (NOTE 5) |
| | 12" | 84 | 63 | 50 | 41 | 35 |
| | 15" | 94 | 70 | 56 | 46 | 39 |
| | 18" | 104 | 78 | 62 | 51 | 43 |
| | 21" | 115 | 85 | 68 | 56 | 48 |
| | 24" | 127 | 93 | 74 | 61 | 52 |
| | 27" | 141 | 102 | 81 | 67 | 57 |
| | 30" | 157 | 111 | 87 | 72 | 61 |
| 19" X 30" | | 157 | 112 | 88 | 73 | 62 |
| | 34" | | 121 | 95 | 78 | 66 |
| 22" X 34" | | | 125 | 97 | 80 | 68 |
| | 36" | | 133 | 102 | 84 | 71 |
| 24" X 38" | | | 140 | 106 | 87 | 74 |
| 27" X 42" | | | 156 | 115 | 94 | 79 |
| | 42" | | 164 | 119 | 96 | 81 |
| 29" X 45" | | | | 130 | 104 | 87 |
| | 48" | | | 140 | 110 | 92 |
| 32" X 49" | | | | 145 | 113 | 94 |
| 34" X 53" | | | | 166 | 123 | 101 |
| | 54" | | | 175 | 126 | 104 |
| | 60" | | | | 147 | 117 |

NOTES: 1. THE DIAMETER OF THE ALTERNATE ROUND UNIT SHALL NOT BE LESS THAN THE LARGER DIMENSION OF THE SPECIFIED RECTANGULAR UNIT IT REPLACES. IT SHALL ALSO BE LARGE ENOUGH TO HAVE THE SPECIFIED GRATE FIT WITHIN THE INSIDE DIAMETER OF THE ROUND ALTERNATE. 2. THE ABOVE VALUES ARE BASED ON THE CENTERLINE OF ALL PIPES INTERSECTING AT THE CENTER OF THE ROUND ALTERNATE. 3. THE ANGLE BETWEEN ADJACENT PIPE ENTRIES SHALL NOT BE LESS THAN THE MINIMUM SHOWN IN THE TABLE ABOVE. WHEN THE ADJACENT PIPES HAVE DIFFERENT SIZES, THE MINIMUM ANGLE SHALL BE THE VALUE FOR THE LARGER OF THE TWO PIPES. 4. THE SUM OF THE MINIMUM ANGLES BETWEEN PIPES AT THE SAME LEVEL SHALL NOT BE MORE THAN 360 DEGREES. THEY SHALL BE REGARDED AS BEING AT THE SAME LEVEL IF THEIR RISES OVERLAP.

5. A BLANK (NO ENTRY) IN TABLE INDICATES THAT THE STRUCTURE IS TOO SMALL FOR PIPE OF THAT SIZE.



INTERNAL

DIAMETER

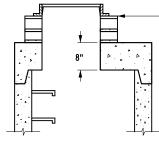
PRECAST ROUND ALTERNATE

THE SPECIFICATIONS OR WHEN INDICATED ON PLANS

PAY LIMITS

8"

8" MIN.



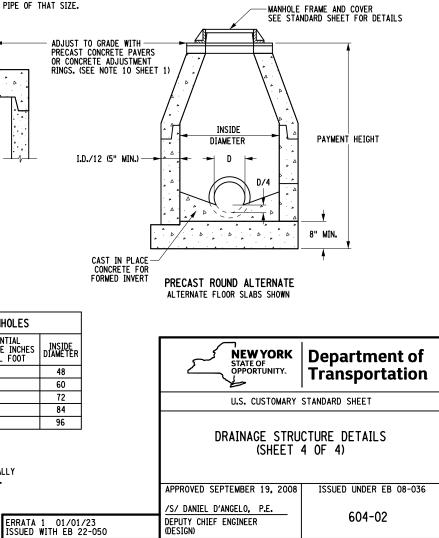
| PRECAST ROUND MANHOLES | | | | | | |
|------------------------|------|---|--|--|--|--|
| ITEM | TYPE | CIRCUMFERENTIAL STEEL - SQUARE INCHES PER VERTICAL FOOT | | | | |
| 604.4048 | 48 | 0.12 | | | | |
| 604.4060 | 60 | 0.15 | | | | |
| 604.4072 | 72 | 0.18 | | | | |
| 604.4084 | 84 | 0.21 | | | | |
| 604.4096 | 96 | 0.24 | | | | |

-ROUND ALTERNATIVES MAY HAVE MONOLITHICALLY CAST, INTEGRAL, OR SEPERATE FLOOR SLABS. (SEE SHEET 1 OF 4)

SHEETS, January 01, STANDARD

2023

| SELECTION | TABLES FOR AL | TERNATE | ROUND | DRAINAGE | STRUC | TURES |
|---------------------------|----------------------------|---------|-----------------|-------------------|-----------------|----------|
| METAL | PIPES | 48" | STRUCTUR 60" | E INTERNAL 72" | DIAMETER 84" | ₹ 96" |
| CMP ARCH SPAN AND RISE | ROUND INTERNAL DIAMETER | MINIMUM | ANGLE BE | TWEEN PIPE | ENTRIES | (NOTE 5) |
| | 12" | 68 | 54 | 45 | 38 | 34 |
| | 15" | 76 | 60 | 50 | 43 | 37 |
| 17" X 13" | | 82 | 64 | 53 | 45 | 40 |
| | 18" | 85 | 67 | 55 | 47 | 41 |
| | | 91 | 71 | 59 | 50 | 43 |
| 21" X 15" | 21" | 94 | 73 | 60 | 51 | 45 |
| 24" X 18" | 24" | 103 | 80 | 66 | 56 | 49 |
| 28" X 20" | | 116 | 89 | 73 | 62 | 54 |
| | 30" | 124 | 94 | 76 | 65 | 56 |
| 35" X 24" | | 145 | 106 | 86 | 72 | 63 |
| | 36" | 152 | 110 | 88 | 74 | 64 |
| 42" X 29" | 42" | | 128 | 101 | 84 | 72 |
| | 48" | | 153 | 115 | 95 | 81 |
| 49" X 33" | | | 158 | 117 | 96 | 82 |
| | 54" | | | 132 | 106 | 90 |
| 57" X 38" | | | | 141 | 112 | 94 |
| 60" X 46" | | | | 150 | 117 | 98 |
| | 60" | | | 154 | 119 | 100 |
| 64" X 43" | | | | 1 1 | 129 | 107 |
| | 66" | | | 1 1 | 134 | 110 |
| 71" X 47" | | | | | 151 | 120 |
| | 72" | | | | 155 | 122 |



DEFINITION OF TERMS:

DRIVEWAY - EVERY ENTRANCE OR EXIT USED BY VEHICULAR TRAFFIC TO AND FROM LANDS OR BUILDINGS ABUTTING A HIGHWAY.

RESIDENTIAL DRIVEWAY - A DRIVEWAY SERVING FOUR OR FEWER PRIVATE HOMES OR AN APARTMENT BUILDING FOR FOUR OR FEWER FAMILY UNITS.

COMMERCIAL DRIVEWAY - A DRIVEWAY SERVING A COMMERCIAL ESTABLISHMENT, INDUSTRY, GOVERNMENTAL OR EDUCATIONAL INSTITUTION, PRIVATE UTILITY, HOSPITAL, CHURCH, APARTMENT BUILDING, OR OTHER COMPARABLE TRAFFIC GENERATOR.

MAJOR COMMERCIAL DRIVEWAY - ANY COMMERCIAL DRIVEWAY WHERE THE ACTUAL OR ANTICIPATED TRAFFIC VOLUME ON A TYPICAL DAY IS DEFINED BY THE DRIVEWAY POLICY AS DEFINED IN THE HIGHWAY DESIGN MANUAL (HDM) CHAPTER 5 APPENDIX 5A.

MINOR COMMERCIAL DRIVEWAY - ANY COMMERCIAL DRIVEWAY WHERE THE ACTUAL OR ANTICIPATED TRAFFIC VOLUMES ON A TYPICAL DAY ARE LESS THAN THE VALUES STIPULATED FOR A MAJOR COMMERCIAL DRIVEWAY.

FIELD ENTRANCE - A DRIVEWAY SERVING A FARMYARD, CULTIVATED OR UNCULTIVATED FIELD, TIMBERLAND, OR UNDEVELOPED LAND NOT USED FOR INDUSTRIAL, COMMERCIAL, OR RESIDENTIAL PURPOSES.

URBAN / RURAL - THE AREA CHARACTER BASED ON NYSDOT HIGHWAY DESIGN MANUAL CHAPTER 2. SECTION 2.4.

DRIVEWAY OFFSET - THE DISTANCE IN FEET MEASURED FROM THE INSIDE EDGE OF THE OUTERMOST TRAVEL LANE, OR TURNING LANE, TO THE HIGHWAY EDGE OF PAVEMENT. THE DISTANCE IS EQUAL TO THE WIDTH OF THE OUTERMOST LANE AND THE WIDTH OF THE PAVED SHOULDER, OR CURB OFFSET.

HIGHWAY EDGE OF PAVEMENT - THE OUTSIDE EDGE OF THE PAVED HIGHWAY SURFACE.

SHOULDER WIDTH - THE WIDTH IN FEET OF PAVED SHOULDER INCLUDING A PARKING LANE. BIKE LANE, CURB OFFSET, OR OTHER PAVED AREA OUTSIDE OF THE TRAVEL LANE.

MINIMUM PAVING LIMIT (MPL) - THE MINIMUM DISTANCE IN FEET MEASURED ALONG THE CENTERLINE OF A DRIVEWAY FROM THE OUTSIDE EDGE OF THE OUTERMOST TRAVEL LANE THAT A DRIVEWAY MUST BE PAVED (INCLUDES THE SHOULDER WIDTH).

PAVEMENT LENGTH (PL) - THE DISTANCE IN FEET MEASURED ALONG THE CENTERLINE OF A DRIVEWAY FROM THE HIGHWAY EDGE OF PAVEMENT TO THE END OF PROPOSED DRIVEWAY PAVEMENT

TRANSITION LENGTH (TL) - THE DISTANCE IN FEET MEASURED ALONG THE CENTERLINE OF A DRIVEWAY BEYOND THE DRIVEWAY PAVEMENT LENGTH (PL) TO THE END OF PROPOSED DRIVEWAY WORK. THE TRANSITION LENGTH (TL) IS TYPICALLY USED FOR GRADING, LAYOUT, OR TRANSITION REASONS. THE TRANSITION LENGTH (TL) ONLY APPLIES TO DRIVEWAYS THAT ARE UNPAVED

BUFFER ZONE - A PHYSICAL DISTANCE SEPARATING THE PEDESTRIAN ACCESS ROUTE AND THE VEHICLE TRAVELED WAY. THE BUFFER ZONE BUFFERS PEDESTRIANS FROM TRAFFIC AND PROVIDES SPACE FOR SNOW STORAGE, UTILITIES, PLANTS, AND OTHER STREET APPURTENANCES. THE BUFFER ZONE MAY BE PLANTED OR PAVED.

SHARED-USE-PATH (SUP) - A BICYCLE AND PEDESTRIAN FACILITY, TYPICALLY WITHIN THE RIGHT-OF-WAY, SEPARATED FROM MOTORIZED VEHICULAR TRAFFIC BY A BUFFER ZONE OR BARRIER. REFER TO HIGHWAY DESIGN MANUAL CHAPTER 17 AND AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES FOR GUIDANCE ON BUFFER ZONE WIDTH AND SEPARATION OF SHARED USE PATHS FROM ROADWAYS.

SIDEWALK - A SMOOTH, STABLE AND SLIP RESISTANT EXTERIOR PATHWAY INTENDED FOR PEDESTRIAN USE ALONG A VEHICULAR WAY SEPARATED WITH A CURB OFFSET.

HMA - HOT MIX ASPHALT

PCC - PORTLAND CEMENT CONCRETE

GENERAL NOTES FOR DRIVEWAY STANDARD SHEETS:

- THE DRIVEWAY STANDARD SHEETS APPLY TO FIELD ENTRANCES, RESIDENTIAL DRIVEWAYS AND MINOR COMMERCIAL DRIVEWAYS. FIELD ENTRANCES AND RESIDENTIAL DRIVEWAYS ACCOMMODATE AN AASHTO PASSENGER CAR DESIGN VEHICLE. MINOR COMMERCIAL DRIVEWAYS ACCOMMODATE AN AASHTO SINGLE UNIT 1. TRUCK DESIGN VEHICLE.
- 2. DRIVEWAY WORK PERFORMED OFF THE RIGHT-OF-WAY REQUIRES AN EASEMENT OR A DRIVEWAY RELEASE. A DRIVEWAY RELOCATION WILL REQUIRE A TEMPORARY EASEMENT MAP.
- IF COMMERCIAL PROPERTY DEVELOPMENT PLANS INVOLVE NEW OR MODIFIED ACCESS TO A STATE HIGHWAY A COMMERCIAL HIGHWAY WORK PERMIT APPLICATION (FORM PERM 33-COM) MUST BE FILLED OUT AND SUBMITTED TO THE REGIONAL PERMIT COORDINATOR.
- 4. SEE THE DRIVEWAY TABLE IN THE CONTRACT PLANS FOR SPECIFIC DRIVEWAY LOCATIONS, WIDTHS ("W"), CORNER ANGLES, LENGTHS ("L"), MATERIAL, AND ENTRANCE TYPE.
- DETECTABLE WARNING SURFACES SHALL BE PROVIDED WHERE THE PEDESTRIAN ACCESS ROUTE CROSSES DRIVEWAYS WITH SIGNAL, YIELD OR STOP CONTROL. DETECTABLE WARNING SURFACES SHALL NOT BE PROVIDED AT CROSSINGS OF UNCONTROLLED DRIVEWAY APRONS. 5.
- THE TAPER METHOD IS GENERALLY NOT RECOMMENDED FOR DRIVEWAYS WITH A DRIVEWAY OFFSET LESS THAN 16 FEET, UNLESS IT CAN BE FIELD VERIFIED THAT THE DRIVEWAY ENTRANCE WIDTH WILL ACCOMMODATE THE VEHICLES THAT USE THE DRIVEWAY ON A REGULAR BASIS. 6.
- 7. TYPE 3 AND TYPE 4 DRIVEWAY ENTRANCES CAN BE USED WITHOUT CURB IF A TAPER STYLE ENTRANCE BETTER MATCHES THE HIGHWAY CORRIDOR AESTHETICS OR SPECIFIC SITE CONDITIONS THAN A RADIUS
- 8. UP TO 10" OF HMA MAY BE REQUIRED FOR HEAVY TRUCKS PER CONTRACT DOCUMENTS.
- 9. UP TO 9" OF PCC MAY BE REQUIRED FOR HEAVY TRUCKS PER CONTRACT DOCUMENTS.
- 10. UP TO 12" OF SUBBASE MAY BE REQUIRED FOR HEAVY TRUCKS PER CONTRACT DOCUMENTS.
- 11. THE DETAILS SHOW THE PAVEMENT LENGTH ("PL") EXTENDING TO THE MINIMUM PAVING LIMIT ("MPL"). HOWEVER, THE "PL" CAN EXTEND BEYOND THE "MPL" AS SPECIFIED IN THE CONTRACT DOCUMENTS.
- 12. A DRIVEWAY TIP-UP SECTION SHOULD EXTEND TO A LOGICAL TERMINI (EXAMPLE: SIDEWALK EDGE, WHERE THE DRIVEWAY GRADE MATCHES EXISTING GROUND, OR LAYOUT POINTD. FOR REFERENCE, A REASONABLE LENGTH FOR TAPERING THE TIP-UP SECTION BACK TO THE DGE OF DRIVEWAY IS 3 TO 4 TIMES THE LENGTH OF CURB DROP. THE TIP-UP SECTION IS NOT PART OF THE DRIVEWAY OPENING WIDTH. REFER TO NYSDOT STANDARD SHEET 609-02 "MISCELLANEOUS CURB DETAILS" FOR THE CURB TRANSITION.
- TO DETERMINE THE LIMITS OF SHOULDER RECONSTRUCTION, REFER TO THE DRIVEWAY OPENING TABLES ON SHEET 4 FOR NO SHOULDER (O' OFFSET).
- 14. FOR PCC SHOULDERS, SEE STANDARD SHEET 502-02 FOR LONGITUDINAL JOINT TIE DETAILS.
- 15. DIMENSIONS AND ANGLES MAY BE INTERPOLATED FOR VALUES OTHER THAN THOSE SHOWN IN THE TABLES.
- 16. THE SHOULDER PAVEMENT THICKNESSES SHOWN ARE DEFAULT VALUES UNLESS OTHERWISE SHOWN IN THE PLANS. MATERIALS SHALL BE AS SPECIFIED IN THE CONTRACT DOCUMENTS.

WIDTH / LENGTH:

- 17. WHERE THERE ARE CONSTRAINTS THAT PREVENT THE CONSTRUCTION OF THE DRIVEWAY OPENING USING EITHER OF THE LAYOUT METHODS, THE ENGINEER MAY SPECIFY A SMALL CORNER CURB RADIUS OF 2' (OR A "1/2 BULL NOSE" CURB ALONG LOW SPEED HIGHWAYS), PROVIDED THE DRIVEWAY OPENING MEETS THE REQUIREMENTS OF THE "DRIVEWAY OPENING" TABLES ON SHEET 4.
- 18. FOR RESIDENTIAL DRIVEWAYS, THE MINIMUM PAVING LIMIT SHALL BE 10' FROM THE OUTSIDE EDGE OF TRAVEL LANE OR 2' BEHIND ANY SIDEWALK, IF PRESENT, WHICHEVER IS GREATER. FOR MINOR COMMERCIAL DRIVEWAYS, THE MINIMUM PAVING LIMIT SHALL BE 30' FROM THE OUTSIDE EDGE OF TRAVEL LANE, OR 2' BEHIND ANY SIDEWALK, IF PRESENT, OR EXTEND TO THE RIGHT-OF-WAY LENGE OF TRAVEL LANE, OR 2' BUT AND ANY SIDEWALK, IF PRESENT, OR EXTEND TO THE RIGHT-OF-WAY LENGE WAYS AND TO TRANSITION TO PAVING LIMIT MAY EXTEND BEYOND THE MINIMUM PAVING LIMIT FOR NEW DRIVEWAYS AND TO TRANSITION TO EXISTING PAVED DRIVEWAYS. THE PAVING LIMIT WILL BE NOTED IN THE DRIVEWAY TABLE OF THE CONTRACT PLANS.
- 19. FOR GRADING AND CONSTRUCTION REQUIREMENTS OF TRANSITIONS FROM PLACED HMA TO EXISTING HMA DRIVEWAYS, REFER TO DETAIL 9 "TIE-IN TO EXISTING DRIVEWAYS" ON SHEET 9, AND TABLE 3 -"DRIVEWAY MATERIALS AND THICKNESS" ON SHEET 2.
- 20. FOR PCC DRIVEWAYS, REFER TO THE 502 SERIES STANDARD SHEETS FOR METAL REINFORCEMENT, JOINT TIES, SAWING AND SEALING, ETC.
- 21. A 5' MINIMUM BUFFER ZONE SHALL BE USED UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.

| DESIGN ELEMENT TOLERANCES | | | | | | | |
|--|----------------------------------|------------------------------|--|--|--|--|--|
| ELEMENT | DESIGN AND FIELD Layout limit | LIMIT FOR WORK Acceptance | | | | | |
| SIDEWALK CROSS SLOPE - SEE NOTE 12 | 1.5% MAX. | 2.0% MAX. | | | | | |
| SIDEWALK GRADE (RUNNING SLOPE) - SEE NOTE 11 | 4.5% MAX. | 5.0% MAX. | | | | | |
| CURB RAMP GRADE (RUNNING SLOPE) - SEE NOTE 21 | 7.5% MAX. | 8.3% MAX. | | | | | |
| BLENDED TRANSITION GRADE (RUNNING SLOPE) - SEE NOTE 7 | 4.5% MAX. | 5.0% MAX. | | | | | |
| NOTES REFERENCED IN THE TABLE ABOVE CAN BE FOUND ON STANDARD | SHEET 608-01 SHEET | 1 OF 9. | | | | | |

ALL VALUES SHOWN ON THE 608-03 STANDARD SHEETS REFER TO DESIGN AND FIELD LAYOUT LIMITS.

FOR ADDITIONAL REQUIREMENTS AND TOLERANCES, SEE "CRITICAL ELEMENTS FOR THE DESIGN, LAYOUT, AND CONSTRUCTION OF PEDESTRIAN FACILITIES" AVAILABLE ON THE NYSDOT HIGHWAY DESIGN MANUAL CHAPTER 18 WEBSITE.

25. 26.

28.

30.

MATERIAL:

31. 32.

SITE CONDITIONS (SIDEWALK / CURB):

22. ANY PCC SIDEWALK WHICH CROSSES A DRIVEWAY SHALL HAVE A MINIMUM THICKNESS OF 6" AND INCLUDE STEEL MESH REINFORCEMENT WITH 3" OF TOP COVER.

23. FOR GRADE CHANGES REFER TO THE DRIVEWAY PROFILES ON SHEET 8. VERTICAL CURVES ARE RECOMMENDED TO CONNECT TANGENTS. SEE TABLE 5 - 'MINIMUM LENGTH OF VERTICAL CURVE' ON SHEET 2 FOR TYPICAL VERTICAL CURVE LENGTHS "L".

24. WHERE THE EXISTING GRADE OF THE DRIVEWAY PROFILE IS LESS THAN OR EQUAL TO 2%, MATCH THE CROSS SLOPE OF THE SIDEWALK TO THE EXISTING DRIVEWAY PROFILE GRADE.

WHERE THE EXISTING GRADE OF THE DRIVEWAY PROFILE EXCEEDS 2% SAWCUT THE DRIVEWAY AND RECONSTRUCT A MINIMUM OF 2' ON BOTH SIDES OF THE SIDEWALK, TO TRANSITION FROM THE EXISTING GRADE OF THE DRIVEWAY PROFILE TO THE SIDEWALK CROSS SLOPE.

TO PREVENT DRIVEWAY GRADES FROM EXCEEDING THE VALUES IN TABLE 2 - 'MAXIMUM TO THE VENT SLOPE'ON SHEET 2, IT MAY BE NECESSARY TO DEPRESS THE SIDEWALK ACROSS THE DRIVEWAY. SIDEWALK RAMPS SHALL HAVE THE LEAST RUNNING SLOPE POSSIBLE, WITH A MAXIMUM DESIGN AND LAYOUT SLOPE OF 7.5%. THE RUNNING SLOPE FOR WORK ACCEPTANCE SHALL BE A MAXIMUM OF 8.3%. WHERE EXISTING CONDITIONS DO NOT ALLOW HOKE ACCELTANCE SHALL BE A MAXIMUM OF 8.3%. WHERE EXISTING CONDITIONS DO NOT ALLOW THE CONSTRUCTION OF A SIDEWALK RAMP AT 8.3% OR LESS RUNNING SLOPE, THE RAMP LENGTH SHALL NOT BE REQUIRED TO EXCEED 15'-1" FOR DESIGN AND LAYOUT. THE RAMP LENGTH SHALL NOT BE REQUIRED TO EXCEED 15'-0" FOR WORK ACCEPTANCE.

27. WHERE DRAINAGE IS CARRIED ALONG THE CURB, CONSTRUCT THE DRIVEWAY WITH A SHORT UPGRADE TO PREVENT RUNOFF FROM PONDING AT THE DRIVEWAY ENTRANCE (FLAT DRIVEWAY) OR RUNNING DOWN THE DRIVEWAY (DOWNHILL DRIVEWAY SLOPE). IF CONDITIONS MAKE THE ADDITION OF A SHORT UPGRADE IMPRACTICAL, USE 1" CURB REVEAL AND CONTINUE CURB ACROSS THE DRIVEWAY OPENING, TYPICALLY, CURB REVEAL WILL NOT BE CONSTRUCTED IN RUNAL AREAS. IF CURB REVEAL IS SPECIFIED FOR A SPECIFIC DRIVEWAY, IT WILL BE NOTED IN THE DRIVEWAY TABLE OF THE CONTRACT PLANS IN THE 'COMMENTS' COLUMN.

ENTRANCE TYPE:

THE ENGINEER MAY INTERCHANGE TYPE 1, TYPE 3 AND TYPE 4 RESIDENTIAL DRIVEWAYS TO BETTER MATCH THE EXISTING ENTRANCE TYPES ALONG THE HIGHWAY CORRIDOR WHILE CONSIDERING AVAILABLE SPACE, CONSTRUCTABILITY, SAFETY, AND FUNCTIONALITY. THE DRIVEWAY TYPE SHALL COMPLY WITH TABLE 4 - 'DRIVEWAY ENTRANCE TYPE SELECTION'

29. FOR DRIVEWAYS WITH VARYING WIDTHS AND/OR CURVED ALIGNMENTS, DETERMINE THE DRIVEWAY WIDTH AND CORNER ANGLE 20'-O" FROM THE EDGE OF TRAVEL LANE.

FOR A ONE-WAY DRIVEWAY ENTRANCE OR EXIT, THE DRIVEWAY ENTRANCE WIDENING IS ONLY NECESSARY ON ONE SIDE OF THE DRIVEWAY TO ACCOMMODATE THE SHARPER TURNING NOVEMENT. ONE-WAY DRIVEWAYS WILL BE IDENTIFIED ON THE DRIVEWAY TABLE OF THE CONTRACT PLANS UNDER 'COMMENTS'. FOR CURBED HIGHWAYS, A SMALL CORNER CURB RADIUS OF 2' (OR '1/2 BULLNOSE' CURB ALONG LOW SPEED HIGHWAYS) SHALL BE CONSTRUCTED TO ELIMINATE A SHARP CORNER BEND IN THE CURB LINE (WHICH IS SAFER FOR SNOWPLOW OPERATIONS).

FOR DRIVEWAY MATERIAL REQUIREMENTS, USE TABLE 3 - 'DRIVEWAY MATERIALS AND THICKNESS' ON SHEFT 2.

FOR FIELD ENTRANCES, THE MATERIAL WITHIN THE PAVEMENT LENGTH ("PL") CAN CONSIST OF GRAVEL OR STONE AND BE CONNECTED TO THE EDGE OF THE HIGHWAY SHOULDER WITHOUT REMOVING ANY OF THE EXISTING SHOULDER MATERIAL.

| NEW YORK STATE OF OPPORTUNITY. | Department of Transportation | | | | | | |
|---|---------------------------------|--|--|--|--|--|--|
| U.S. CUSTOMARY STANDARD SHEET | | | | | | | |
| RESIDENTIAL AND MINOR COMMERCIAL DRIVEWAYS (SHEET 1 OF 9) | | | | | | | |
| APPROVED MARCH 07, 2016 | ISSUED UNDER EB 16-012 | | | | | | |
| /S/ RICHARD W. LEE, P.E. DEPUTY CHIEF ENGINEER (DESIGN) | 608-03 | | | | | | |

| TABLE 1 RECOMMENDED DRIVEWAY WIDTH "W" | | | | | | | | |
|---|--|--|--|--|--|--|--|--|
| DRIVEWAY CLASSIFICATION | PERMISSIBLE RANGE OF WIDTHS (FT.) WITHIN 30 FT. OF TRAVELED WAY FOR ROADS POSTED 40 MPH OR LESS | PERMISSIBLE RANGE OF WIDTHS (FT.) WITHIN 30 FT. OF TRAVELED WAY FOR ROADS POSTED 45 MPH OR MORE | | | | | | |
| RESIDENTIAL LESS THAN 50 FT. IN LENGTH MEASURED ALONG THE CENTERLINE | 9 TO 12 | 10 TO 24 | | | | | | |
| RESIDENTIAL GREATER THAN 50 FT. IN LENGTH MEASURED ALONG THE CENTERLINE | 9 TO 12 | 10 TO 14 | | | | | | |
| MINOR COMMERCIAL SHARED TWO-WAY DRIVEWAY | 22 TO 30 | 28 TO 35 | | | | | | |
| MINOR COMMERCIAL DIVIDED OR ONE-WAY DRIVEWAY | 12 TO 24 | 12 TO 24 | | | | | | |
| MINOR COMMERCIAL MULTI-LANE DRIVEWAY | 12 TO 15 EACH LANE | 14 TO 16 EACH LANE | | | | | | |

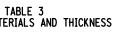
| MAX | TABLE 2 MAXIMUM DRIVEWAY SLOPE | | | | | | | |
|---------------------------|-----------------------------------|-------------------------|--|--|--|--|--|--|
| ROADWAY CLASSIFICATION | MINOR COMMERCIAL DRIVEWAY | RESIDENTIAL DRIVEWAY | | | | | | |
| RURAL | 10% | 12% | | | | | | |
| URBAN | 6% | 8% | | | | | | |

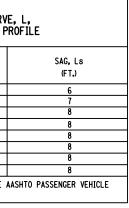
| | TABLE 3 DRIVEWAY MATERIALS AND THICKNESS | | | | | | | | | |
|-------------------------------|--|---|-----------------|---|---|-------------------------------|--|--|--|--|
| | WITHIN DR | IVEWAY PAVEMENT LE | NGTH ("PL") | WITH | IN TRANSITION LENGTH (| "TL") | | | | |
| PROPOSED OR EXISTING DRIVE | WITHIN DRIVEWAY PAVEMENT LENGTH D OR DRIVE MATERIAL THICKNESS FOR RESIDENTIAL (IN,) MIN MASS, VEL HMA 3 1 SUBBASE COURSE 6 1 E SUBBASE COURSE 6 1 CING) HMA 1½ 1 HMA 3 1½ 1 HMA 1½ 1 1 HMA 3 1 1 HMA 1½ 1 1 HMA 3 1 1 1 HMA 3 1 1 1 1 | THICKNESS FOR MINOR COMMERCIAL (IN.) | MATERIAL | THICKNESS FOR RESIDENTIAL (IN.) | THICKNESS FOR MINOR COMMERCIAL (IN.) | | | | | |
| DIRT, GRASS, | НМА | 3 | 4 | SUBBASE COURSE, EXCAVATE AS | SUBBASE COURSE, EXCAVATE AS 6 | | | | | |
| OR GRAVEL | SUBBASE COURSE | 6 | 8 | NECESSARY | | 9 | | | | |
| STONE | НМА | 3 | 4 | STONE, EXCAVATE | | | | | | |
| STUNE | SUBBASE COURSE | 6 | 8 | AS NECESSARY | 8 | 11 | | | | |
| НМА | НМА | 11/2 | 11/2 | NOT APPLICAB | LE - ALL WORK ON AN E | XISTING PAVED | | | | |
| (RESURFACING) | | AS NECESSARY | AS NECESSARY | DRIVEWAY IS WITHIN THE DRIVEWAY PAVEMENT LENGTH | | | | | | |
| НМА | НМА | 3 | 4 (SEE NOTE 8) | NOT APPLICAB | LE - ALL WORK ON AN E | XISTING PAVED | | | | |
| (RECONSTRUCTION) | SUBBASE COURSE | 6 | 8 (SEE NOTE 10) | DRIVEWAY IS WITHIN THE DRIVEWAY PAVEMENT LENGTH | | | | | | |
| PCC | PCC | 6 | 6 (SEE NOTE 9) | NOT APPLICAB | LE - ALL WORK ON AN E | ALL WORK ON AN EXISTING PAVED | | | | |
| | SUBBASE COURSE | 6 | 8 (SEE NOTE 10) | | VITHIN THE DRIVEWAY PA | | | | | |

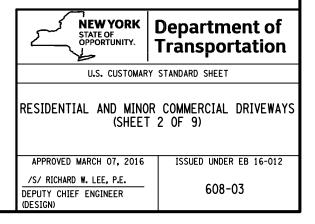
| | TABLE 4 DRIVEWAY ENTRANCE TYPE SELECTION | | | | | | | | | |
|--------------------|---|--|---|-----------------------------------|---------------------------------------|---|---------------------------------------|--|--|--|
| CONDITIONS FOR USE | | | | | | | | | | |
| ENTRANCE WIDENING | | DRIVEWAY Classification (Note 1) | IFICATION CURNER AND SHOULDER CURB SIDEWALK | | HIGHWAY DESIGN SPEED | RECOMMENDED USE | | | | |
| TYPE 1 | RADIUS | RESIDENTIAL OR MINOR COMMERCIAL | 60° T0 120° | ANY | USE WITH OR WITHOUT CURB | USE WITHOUT SIDEWALK | ANY SPEED | RECOMMENDED FOR ALL LOCATIONS (EXCEPT FOR MINOR COMMERCIAL WITH CURB) | | |
| TYPE 2 | RADIUS | MINOR Commercial Only | 60° T0 120° | ANY | USE ONLY WITH CURB | USE WITH OR WITHOUT SIDEWALK | ANY SPEED | RECOMMENDED ONLY FOR MINOR Commercial With Curb | | |
| TYPE 3 | TAPER | RESIDENTIAL OR MINOR COMMERCIAL | 80° T0 100° | 16' OR GREATER (SEE NOTE 6) | USE ONLY WITH CURB (SEE NOTE 7) | USE ONLY WITH SIDEWALK OFFSET A MIN. OF 2' FROM THE EDGE OF PAVEMENT OR WITHOUT SIDEWALK | ONLY LOW SPEED (45 MPH OR LESS) | ALTERNATIVE ENTRANCE TYPE (TYPICALLY FOR URBAN AREA USE) | | |
| TYPE 4 | TAPER | RESIDENTIAL OR MINOR COMMERCIAL | 80° T0 100° | 16' OR GREATER (SEE NOTE 6) | USE ONLY WITH CURB (SEE NOTE 7) | USE ONLY WITH SIDEWALK LESS THAN 2' FROM OR ADJACENT TO THE EDGE OF PAVEMENT | ONLY LOW SPEED (45 MPH OR LESS) | ALTERNATIVE ENTRANCE TYPE (TYPICALLY FOR URBAN AREA USE) | | |

| | TABLE 5 GTH OF VERTICAL CURVI GRADE IN DRIVEWAY P |
|--|---|
| CHANGES IN GRADE A= G2-G1 | CREST, Lc (FT.) |
| 4-6% | 5 |
| 6-8% | 5 |
| 8-10% | 6 |
| 10-12% | 6 |
| 12-14% | 7 |
| 14-16% | 7 |
| 16-18% | 8 |
| 18-20% | 8 |
| LENGTH OF VERTICAL CURVE BASED ON AND SINGLE UNIT TRUCK CLEARANCES. | 35' CURVE RADIUS AND THE A |
| | |

TABLE 4 ONLY APPLIES TO RESIDENTIAL AND MINOR COMMERCIAL DRIVEWAYS, FOR OTHER DRIVEWAY CLASSIFICATIONS (MAJOR COMMERCIAL, FIELD ENTRANCE, ETC.), REFER TO THE NYSDOT HIGHWAY DESIGN MANUAL CHAPTER 5, APPENDIX 5A "POLICY AND STANDARDS FOR THE DESIGN OF ENTRANCES TO STATE HIGHWAYS".







DRIVEWAY OPENING LAYOUT:

THERE ARE TWO RECOMMENDED DRIVEWAY OPENING WIDENING METHODS: (1.) THE RADIUS METHOD, WHICH UTILIZES A CIRCULAR ARC TO WIDEN THE DRIVEWAY, AND (2.) THE TAPER METHOD, WHICH UTILIZES A STRAIGHT TAPER WIDENING OUT AT AN ESTABLISHED FLARE RATE.

THE RADIUS METHOD IS THE TYPICAL METHOD, ALTHOUGH THE TAPER METHOD IS A REASONABLE ALTERNATIVE FOR URBAN AREAS AND OTHER AREAS WHERE IT MIGHT BETTER MATCH THE HIGHWAY CORRIDOR AESTHETICS AND FUNCTIONALITY. SEE TABLE 4 - 'DRIVEWAY ENTRANCE TYPE SELECTION' ON SHEET 2 FOR ADDITIONAL VARIABLES CONCERNING THE SELECTION OF A DRIVEWAY OPENING WIDENING METHOD.

RADIUS METHOD OF LAYOUT:

- STEP 1. LOCATE AN OFFSET LINE 11' PARALLEL FROM THE INSIDE EDGE OF THE OUTERMOST TRAVEL LANE.
- STEP 2. SCRIBE A LINE PARALLEL TO THE OFFSET LINE, OFFSET "R" FEET (SEE TABLE 6).
- STEP 3. SCRIBE A LINE PARALLEL TO THE EDGE OF DRIVEWAY (NEAR SIDE), OFFSET "R" FEET.
- STEP 4. FIND THE CENTER POINT OF THE CORNER RADIUS ARC, WHICH IS LOCATED AT THE INTERSECTION OF THE LINES FROM STEPS 2 AND 3.
- STEP 5. FROM THE CENTER POINT, SCRIBE AN ARC WITH RADIUS "R", WHICH IS TANGENT TO BOTH THE OFFSET LINE AND THE EDGE OF DRIVEWAY. THE ARC SHOULD INTERSECT THE LINES AT THE DISTANCES "X" LISTED IN TABLE 7. DISTANCES IN TABLE 7 ARE AS MEASURED FROM THE INTERSECTION POINT OF THE OFFSET LINE (NOT THE EDGE OF TRAVEL LANE) AND THE PROJECTED EDGE OF DRIVEWAY TO EITHER OF THE ARC TANGENT POINTS (SAME DISTANCE ALONG THE OFFSET LINE (NOT THE PROJECTED EDGE OF DRIVEWAY).
- STEP 6. FIND THE DRIVEWAY OPENING LIMIT POINT WHICH IS WHERE THE ARC INTERSECTS THE HIGHWAY EDGE OF PAVEMENT.
- STEP 7. REPEAT STEPS 1 6 FOR THE OTHER SIDE OF THE DRIVEWAY OPENING.

FIELD LAYOUT NOTES:

FOR THE RADIUS METHOD OF LAYOUT, IF OBSTRUCTIONS HINDER THE ABILITY TO SCRIBE THE CORNER ANGLE ARC FROM THE CENTER POINT, LOCATE POINTS ALONG THE ARC BY USING "Y" VALUES FROM TABLES 9 THROUGH 11 ON SHEET 4 AT VARIOUS DRIVEWAY OFFSETS ("Y" IS MEASURED FROM THE PROJECTED EDGE OF DRIVEWAY TO THE ARC).

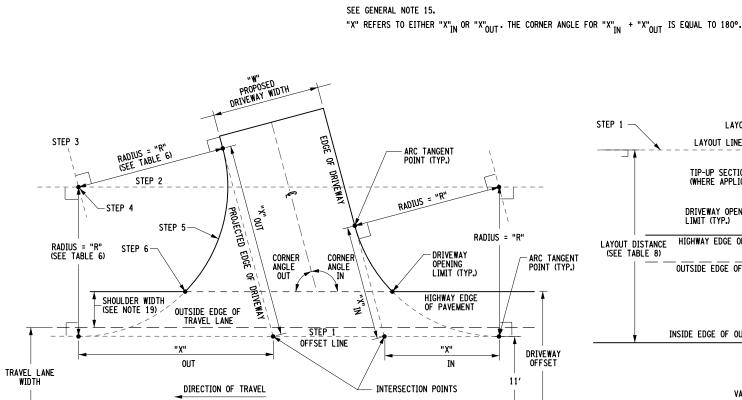
TAPER METHOD OF LAYOUT:

TAPER METHOD OF LAYOUT IS NOT RECOMMENDED FOR DRIVEWAYS WITH CORNER ANGLES LESS THAN 80° OR GREATER THAN 100°, NOR IS IT RECOMMENDED FOR DRIVEWAYS WITH A DRIVEWAY OFFSET (OUTER TRAVEL LANE + PAVED SHOULDER) LESS THAN 16°, UNLESS IT CAN BE FIELD VERIFIED THAT THE DRIVEWAY ENTRANCE WIDTH WILL ACCOMMODATE THE VEHICLES THAT USE THE DRIVEWAY ON A REGULAR BASIS.

- STEP 1. SCRIBE A LINE (LAYOUT LINE) OFFSET THE APPROPRIATE 'LAYOUT DISTANCE' (SEE TABLE 8) FROM THE INSIDE EDGE OF THE OUTERMOST TRAVEL LANE.
- STEP 2. LOCATE THE TAPER LAYOUT POINT, WHICH IS AT THE INTERSECTION OF THE EDGE OF DRIVEWAY AND THE LAYOUT LINE.
- STEP 3. SCRIBE A 1:'T' (SEE TABLE 8) TAPER FROM THE LAYOUT POINT TO THE EDGE OF PAVEMENT (WITH 'T' BEING PERPENDICULAR TO THE EDGE OF TRAVEL LANE).
- STEP 4. FIND THE DRIVEWAY OPENING LIMIT POINT WHICH IS WHERE THE TAPER INTERSECTS THE EDGE OF PAVEMENT.
- STEP 5. REPEAT STEPS 1 4 FOR THE OTHER SIDE OF THE DRIVEWAY OPENING.

ALTERNATE TAPER METHOD OF LAYOUT:

FOLLOW THE STEPS AS PER THE ABOVE TAPER LAYOUT METHOD, EXCEPT FOR STEPS 3 AND 4. LOCATE THE DRIVEWAY OPENING LIMIT BY USING THE APPROPRIATE "Y" VALUE FROM EITHER TABLE 12 OR 13 ON SHEET 4. "Y" IS THE DISTANCE BETWEEN THE DRIVEWAY OPENING LIMIT AND THE INTERSECTION POINT OF THE PROJECTED EDGE OF DRIVEWAY AND THE EDGE OF PAVEMENT.



120°



RADIUS LAYOUT VALID FOR RESIDENTIAL OR MINOR COMMERCIAL DRIVEWAYS (FOR THE VALUES OF "R" AND "X" SEE TABLES 6 AND 7, RESPECTIVELY)

ALL GENERAL NOTES AND ABBREVIATIONS REFERENCED ON THIS SHEET CAN BE FOUND ON STANDARD SHEET 608-03, SHEET 1 OF 9.

FILE NAME = 608-0303.dgn DATE/TIME = 08-MAR-2016 14:45 USER = 1montgomery

NOTE:

TABLE 7 RADIUS METHOD - DISTANCE FROM INTERSECTION POINT TO ARC TANGENT POINT

7.5

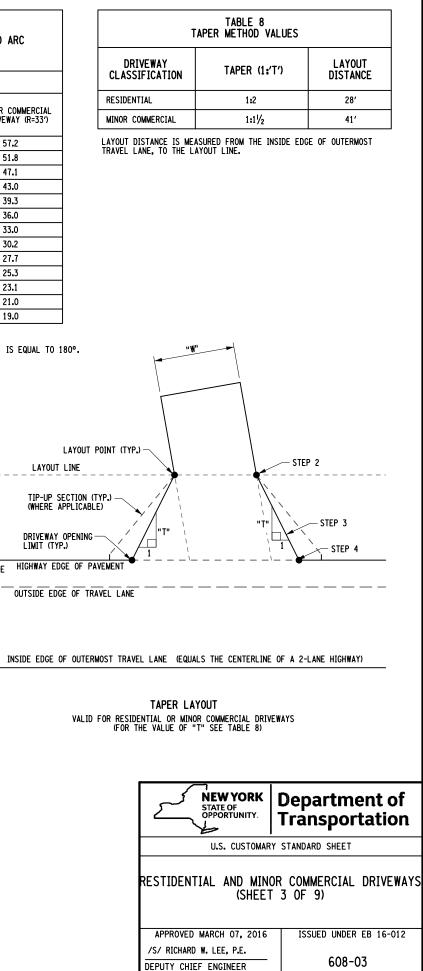
| | TANGEI | | | | | | | | |
|-----------------|---|---|---------------------|--|--|--|--|--|--|
| | | "X" FT. | | | | | | | |
| CORNER ANGLE | RESIDENTIAL DRIVEWAY ≤ 13' WIDE (R=16') | RESIDENTIAL DRIVEWAY > 13' WIDE (R=13') | MINOR CO DRIVEWA | | | | | | |
| 60° | 27.7 | 22.5 | 57. | | | | | | |
| 65° | 25.1 | 20.4 | 51. | | | | | | |
| 70° | 22.8 | 18.6 | 47. | | | | | | |
| 75° | 20.8 | 16.9 | 43.0 | | | | | | |
| 80° | 19.1 | 15.5 | 39.3 | | | | | | |
| 85° | 17.5 | 14.2 | 36.0 | | | | | | |
| 90° | 16.0 | 13.0 | 33.(| | | | | | |
| 95° | 14.7 | 11.9 | 30.2 | | | | | | |
| 100° | 13.4 | 10.9 | 27. | | | | | | |
| 105° | 12.3 | 10.0 | 25. | | | | | | |
| 110° | 11.2 | 9.1 | 23.1 | | | | | | |
| 115° | 10.2 | 8.3 | 21.0 | | | | | | |

9.2

TABLE 6 RADIUS METHOD - CORNER RADIUS DRIVEWAY CLASSIFICATION "R" RESIDENTIAL "W" ≤ 13' 16' RESIDENTIAL "W" > 13' 13'

MINOR COMMERCIAL (ALL WIDTHS)

33'



(DESIGN)

| | DRIVEWAY OPENING "Y" (FT.) VALUES FOR RADIUS METHOD RESIDENTIAL DRIVEWAYS ≤ 13' WIDE (R=16') | | | | | | | | | | |
|--------|---|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| CORNER | | DRIVEWAY OFFSET FROM INSIDE EDGE OF TRAVEL LANE (OR OFFSET FROM OUTSIDE EDGE OF A 12' TRAVEL LANE) | | | | | | | | | |
| ANGLE | 12' (0') | 13′ (1′) | 14' (2') | 15′ (3′) | 16′ (4′) | 17′ (5′) | 18′ (6′) | 19′ (7′) | 20′ (8′) | 21' (9') | 22' (10') |
| 60° | 22.3 | 19.7 | 17.4 | 15.7 | 14.1 | 12.5 | 11.2 | 9.8 | 8.9 | 7.9 | 6.9 |
| 65° | 19.7 | 17.1 | 15.1 | 13.5 | 11.8 | 10.5 | 9.2 | 8.2 | 7.2 | 6.2 | 5.2 |
| 70° | 17.7 | 15.1 | 13.1 | 11.5 | 10.2 | 8.9 | 7.9 | 6.6 | 5.9 | 4.9 | 4.3 |
| 75° | 15.7 | 13.1 | 11.5 | 9.8 | 8.5 | 7.2 | 6.2 | 5.2 | 4.6 | 3.9 | 3.3 |
| 80° | 14.1 | 11.5 | 9.8 | 8.5 | 7.2 | 5.9 | 5.2 | 4.3 | 3.6 | 3.0 | 2.3 |
| 85° | 12.5 | 10.2 | 8.5 | 6.9 | 5.9 | 4.9 | 3.9 | 3.3 | 2.6 | 2.0 | 1.6 |
| 90° | 10.8 | 8.9 | 7.2 | 5.9 | 4.9 | 3.9 | 3.3 | 2.6 | 2.0 | 1.6 | 1.0 |
| 95° | 9.5 | 7.5 | 5.9 | 4.9 | 3.9 | 3.0 | 2.3 | 2.0 | 1.3 | 1.0 | 0.7 |
| 100° | 8.5 | 6.6 | 4.9 | 3.9 | 3.0 | 2.3 | 1.6 | 1.3 | 1.0 | 0.7 | 0.3 |
| 105° | 7.2 | 5.6 | 4.3 | 3.0 | 2.3 | 1.6 | 1.3 | 0.7 | 0.7 | 0.3 | 0.0 |
| 110° | 6.6 | 4.6 | 3.3 | 2.3 | 1.6 | 1.0 | 0.7 | 0.3 | 0.3 | 0.0 | 0.0 |
| 115° | 5.6 | 3.6 | 2.6 | 1.6 | 1.0 | 0.7 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 |
| 120° | 4.6 | 3.0 | 2.0 | 1.3 | 0.7 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

TABLE 9

| TABLE 10 DRIVEWAY OPENING "Y" (FT.) VALUES FOR RADIUS METHOD RESIDENTIAL DRIVEWAYS > 13' WIDE (R=16') | | | | | | | | | | | | |
|---|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|--|
| CORNER | DRIVEWAY OFFSET FROM INSIDE EDGE OF TRAVEL LANE (OR OFFSET FROM OUTSIDE EDGE OF A 12' TRAVEL LANE) | | | | | | | | | | | |
| ANGLE | 12' (0') | 13′ (1′) | 14' (2') | 15′ (3′) | 16′ (4′) | 17′ (5′) | 18′ (6′) | 19′ (7′) | 20′ (8′) | 21' (9') | 22' (10') | |
| 60° | 17.4 | 14.8 | 12.8 | 11.2 | 9.8 | 8.5 | 7.2 | 6.2 | 5.2 | 4.6 | 3.6 | |
| 65° | 15.4 | 12.8 | 11.2 | 9.5 | 8.2 | 6.9 | 5.9 | 4.9 | 4.3 | 3.3 | 2.6 | |
| 70° | 13.5 | 11.2 | 9.5 | 8.2 | 6.9 | 5.9 | 4.9 | 3.9 | 3.3 | 2.6 | 2.0 | |
| 75° | 12.1 | 9.8 | 8.2 | 6.9 | 5.6 | 4.6 | 3.9 | 3.0 | 2.3 | 2.0 | 1.3 | |
| 80° | 10.8 | 8.5 | 6.9 | 5.9 | 4.6 | 3.6 | 3.0 | 2.3 | 2.0 | 1.3 | 1.0 | |
| 85° | 9.2 | 7.2 | 5.9 | 4.6 | 3.6 | 3.0 | 2.3 | 1.6 | 1.3 | 1.0 | 0.7 | |
| 90° | 8.2 | 6.2 | 4.9 | 3.9 | 3.0 | 2.3 | 1.6 | 1.3 | 1.0 | 0.7 | 0.3 | |
| 95° | 7.2 | 5.2 | 4.3 | 3.3 | 2.3 | 1.6 | 1.3 | 0.7 | 0.3 | 0.3 | 0.0 | |
| 100° | 6.2 | 4.6 | 3.3 | 2.3 | 1.6 | 1.3 | 0.7 | 0.3 | 0.3 | 0.0 | 0.0 | |
| 105° | 5.6 | 3.9 | 2.6 | 2.0 | 1.3 | 0.7 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | |
| 110° | 4.6 | 3.3 | 2.0 | 1.3 | 1.0 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 115° | 3.9 | 2.6 | 1.6 | 1.0 | 0.7 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 120° | 3.3 | 2.0 | 1.0 | 0.7 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

TABLE 13 DRIVEWAY OPENING "Y" (FT.) VALUES FOR TAPER METHOD

MINOR COMMERCIAL DRIVEWAYS

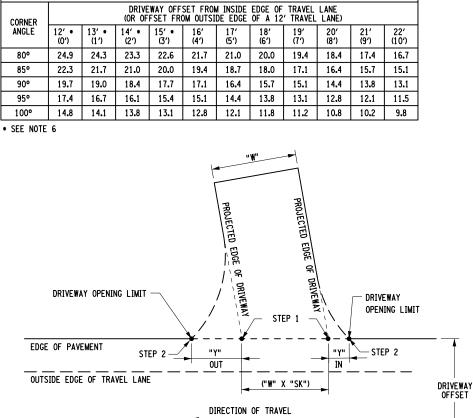
| | Df | RIVEWAY | | | | ALUES | FOR RA Vys (r=3 | | ETHOD | | | |
|-------|---|-------------|-------------|-------------------|----------------|--|---|--------------------------------|----------------------------|-------------|--------------------|--|
| ORNER | DRIVEWAY OFFSET FROM INSIDE EDGE OF TRAVEL LANE (OR OFFSET FROM OUTSIDE EDGE OF A 12' TRAVEL LANE) | | | | | | | | | | | |
| ANGLE | 12' (0') | 13' (1') | 14' (2') | 15' (3') | 16' (4') | 17' (5') | 18' (6') | 19' (7') | 20' (8') | 21' (9') | 22' (10') | |
| 60° | 48.2 | 44.6 | 41.7 | 39.0 | 36.7 | 34.8 | 32.8 | 31.2 | 29.5 | 27.9 | 26.2 | |
| 65° | 43.3 | 39.4 | 36.7 | 34.1 | 32.2 | 30.2 | 28.2 | 26.6 | 24.9 | 23.6 | 22.3 | |
| 70° | 38.7 | 35.1 | 32.2 | 29.9 | 27.9 | 25.9 | 24.3 | 22.6 | 21.3 | 20.0 | 18.7 | |
| 75° | 34.8 | 31.2 | 28.5 | 26.2 | 24.3 | 22.6 | 21.0 | 19.4 | 18.0 | 16.7 | 15.7 | |
| 80° | 31.2 | 27.6 | 24.9 | 23.0 | 21.0 | 19.4 | 17.7 | 16.4 | 15.1 | 14.1 | 12.8 | |
| 85° | 27.9 | 24.6 | 22.0 | 20.0 | 18.0 | 16.7 | 15.1 | 13.8 | 12.8 | 11.5 | 10.5 | |
| 90° | 24.9 | 21.7 | 19.4 | 17.4 | 15.7 | 14.1 | 12.8 | 11.5 | 10.5 | 9.5 | 8.5 | |
| 95° | 22.3 | 19.0 | 16.7 | 14.8 | 13.5 | 11.8 | 10.5 | 9.5 | 8.5 | 7.5 | 6.9 | |
| 100° | 19.7 | 16.7 | 14.4 | 12.8 | 11.2 | 9.8 | 8.9 | 7.5 | 6.6 | 5.9 | 5.2 | |
| 105° | 17.7 | 14.8 | 12.5 | 10.8 | 9.2 | 8.2 | 6.9 | 5.9 | 5.2 | 4.6 | 3.9 | |
| 110° | 15.4 | 12.5 | 10.5 | 8.9 | 7.5 | 6.6 | 5.6 | 4.6 | 3.9 | 3.3 | 2.6 | |
| 115° | 13.5 | 10.8 | 8.9 | 7.2 | 5.9 | 4.9 | 4.3 | 3.3 | 2.6 | 2.3 | 1.6 | |
| | 1 44 5 | | | | | | | | 4.0 | 1.3 | 1.0 | |
| 120° | 11.5 | 8.9 | 7.2 | 5.6 | 4.6 | 3.6 | 3.0 | 2.3 | 1.6 | 1.5 | 1.0 | |
| C | DRNER AN | DRI | DRIVE | WAY OF ENING W | TABL PENING | .E 14 WIDTH (Y _{IN} " + (" | 3.0 CALCULA W × "SK" 75°/105 1.04 | ATION ') + "Y _{OI} | JT ["] 00° 85' | 2/95° | <u>90°</u> 1.00 | |

| | DF | RIVEWAY | | | | | | | ETHOD | | | |
|----------------------------------|--|-------------|-------------|-------------|-------------|---|-------------|-----------------------|-------------|-------------|-------------------|--|
| ORNER | DRIVEWAY OFFSET FROM INSIDE EDGE OF TRAVEL LANE (OR OFFSET FROM OUTSIDE EDGE OF A 12' TRAVEL LANE) | | | | | | | | | | | |
| ANGLE | 12' (0') | 13' (1') | 14' (2') | 15′ (3′) | 16' (4') | 17' (5') | 18' (6') | 19' (7') | 20' (8') | 21' (9') | 22' (10') | |
| 60° | 48.2 | 44.6 | 41.7 | 39.0 | 36.7 | 34.8 | 32.8 | 31.2 | 29.5 | 27.9 | 26.2 | |
| 65° | 43.3 | 39.4 | 36.7 | 34.1 | 32.2 | 30.2 | 28.2 | 26.6 | 24.9 | 23.6 | 22.3 | |
| 70° | 38.7 | 35.1 | 32.2 | 29.9 | 27.9 | 25.9 | 24.3 | 22.6 | 21.3 | 20.0 | 18.7 | |
| 75° | 34.8 | 31.2 | 28.5 | 26.2 | 24.3 | 22.6 | 21.0 | 19.4 | 18.0 | 16.7 | 15.7 | |
| 80° | 31.2 | 27.6 | 24.9 | 23.0 | 21.0 | 19.4 | 17.7 | 16.4 | 15.1 | 14.1 | 12.8 | |
| 85° | 27.9 | 24.6 | 22.0 | 20.0 | 18.0 | 16.7 | 15.1 | 13.8 | 12.8 | 11.5 | 10.5 | |
| 90° | 24.9 | 21.7 | 19.4 | 17.4 | 15.7 | 14.1 | 12.8 | 11.5 | 10.5 | 9.5 | 8.5 | |
| 95° | 22.3 | 19.0 | 16.7 | 14.8 | 13.5 | 11.8 | 10.5 | 9.5 | 8.5 | 7.5 | 6.9 | |
| 100° | 19.7 | 16.7 | 14.4 | 12.8 | 11.2 | 9.8 | 8.9 | 7.5 | 6.6 | 5.9 | 5.2 | |
| 105° | 17.7 | 14.8 | 12.5 | 10.8 | 9.2 | 8.2 | 6.9 | 5.9 | 5.2 | 4.6 | 3.9 | |
| 110° | 15.4 | 12.5 | 10.5 | 8.9 | 7.5 | 6.6 | 5.6 | 4.6 | 3.9 | 3.3 | 2.6 | |
| 115° | 13.5 | 10.8 | 8.9 | 7.2 | 5.9 | 4.9 | 4.3 | 3.3 | 2.6 | 2.3 | 1.6 | |
| 120° | 11.5 | 8.9 | 7.2 | 5.6 | 4.6 | 3.6 | 3.0 | 2.3 | 1.6 | 1.3 | 1.0 | |
| | | | EWAY OF | ENING W | PENING | E 14 WIDTH Y _{IN} " + (' 70°/110° | 'W × "SK | ") + "Y _{OI} | | °/95° | 90° | |
| CORNER ANGLE SKEW FACTOR "SK" | | | 1.1 | | .10 | 1.07 | 1.04 | 1.0 | | .01 | 1.00 | |
| | | | | | | | | | | | | |
| | IF THE DRIVEWAY IS A ONE-WAY ENTRANCE OR EXIT, THEN "Y" OUT OR "Y" IN, RESPECTIVELY, IS NOT INCLUDED IN THE EQUATION. HOWEVER FOR CURBED HIGHWAYS, ADDITIONAL DRIVEWAY OPENING WIDTH SHOULD BE ADDED TO ALLOW FOR A SMALL CORNER CURB RADIUS. THIS ELIMINATES SHARP CORNER BENDS IN THE CURB LINE, WHICH IS SAFER FOR SNOWPLOW OPERATIONS. SAMPLE CALCULATION: | | | | | | | | | | , IS NOT WIDTH | |

16'. THIS WOULD REQUIRE A DRIVEWAY OPENING WIDTH = "Y"70° + ("W" x "SK") + "Y"110°

FIELD LAYOUT:

STEP 1. LOCATE THE INTERSECTION POINTS OF THE PROJECTED EDGES OF DRIVEWAY AND THE EDGE OF PAVEMENT.



INSIDE EDGE OF OUTERMOST TRAVEL LANE (EQUALS THE CENTERLINE OF A 2-LANE HIGHWAY)

PRELIMINARY DRIVEWAY OPENING LAYOUT

ALTHOUGH THE DETAIL ONLY SHOWS A RADIUS ENTRANCE TYPE, THE DETAIL APPLIES TO BOTH RADIUS AND TAPER METHODS OF LAYOUT. FOR THE VALUES OF "Y" REFER TO TABLES 9 THROUGH 13. FOR THE VALUE OF "SK" REFER TO TABLE 14.

TABLE 12 DRIVEWAY OPENING "Y" (FT.) VALUES FOR TAPER METHOD RESIDENTIAL DRIVEWAYS DRIVEWAY OFFSET FROM INSIDE EDGE OF TRAVEL LANE (OR OFFSET FROM OUTSIDE EDGE OF A 12' TRAVEL LANE) 14' * 15' * (2') (3') ANGLE 12' * 13' * (0') (1') 16′ (4′) 17′ (5′) 18′ (6′) 19' 20' (8') 22' (10') 21' (9') (7') 80° 11.2 10.5 9.8 9.2 8.5 7.9 7.2 6.6 5.9 5.2 4.6 85° 9.8 9.2 8.5 7.9 7.5 6.9 6.2 5.6 5.2 4.6 3.9

6.2

5.9 5.2 4.9

4.3

3.6

3.9 3.3

3.3 3.0

6.9 6.6 6.2 5.6 5.2 4.9 4.3 3.9 95° 5.6 5.2 4.9 4.6 4.3 3.9 3.6 3.3 3.0 2.6 2.3 100°

8.2 7.9

SEE NOTE 6

90°

NOTES SPECIFIC TO TABLES 9 THROUGH 14:

TABLES 9 THROUGH 14 ARE FOR PRELIMINARY CURB LINE LAYOUT OF THE DRIVEWAY OPENING WIDTHS. USE THE LAYOUT METHOD DESCRIBED ON SHEET 3 FOR FINAL DRIVEWAY LAYOUT (ALTHOUGH THE DRIVEWAY OPENING LIMITS SHOULD MATCH BETWEEN THE PRELIMINARY AND FINAL LAYOUT TECHNIQUES).

7.2 6.9

THE DRIVEWAY OPENING WIDTH VARIES DEPENDING ON THE DRIVEWAY ENTRANCE WIDENING METHOD USED (RADIUS OR TAPER). THE TAPER METHOD GENERALLY WILL PROVIDE A MORE NARROW DRIVEWAY WIDTH.

"Y" REFERS TO EITHER "Y" IN OR "Y"OUT.

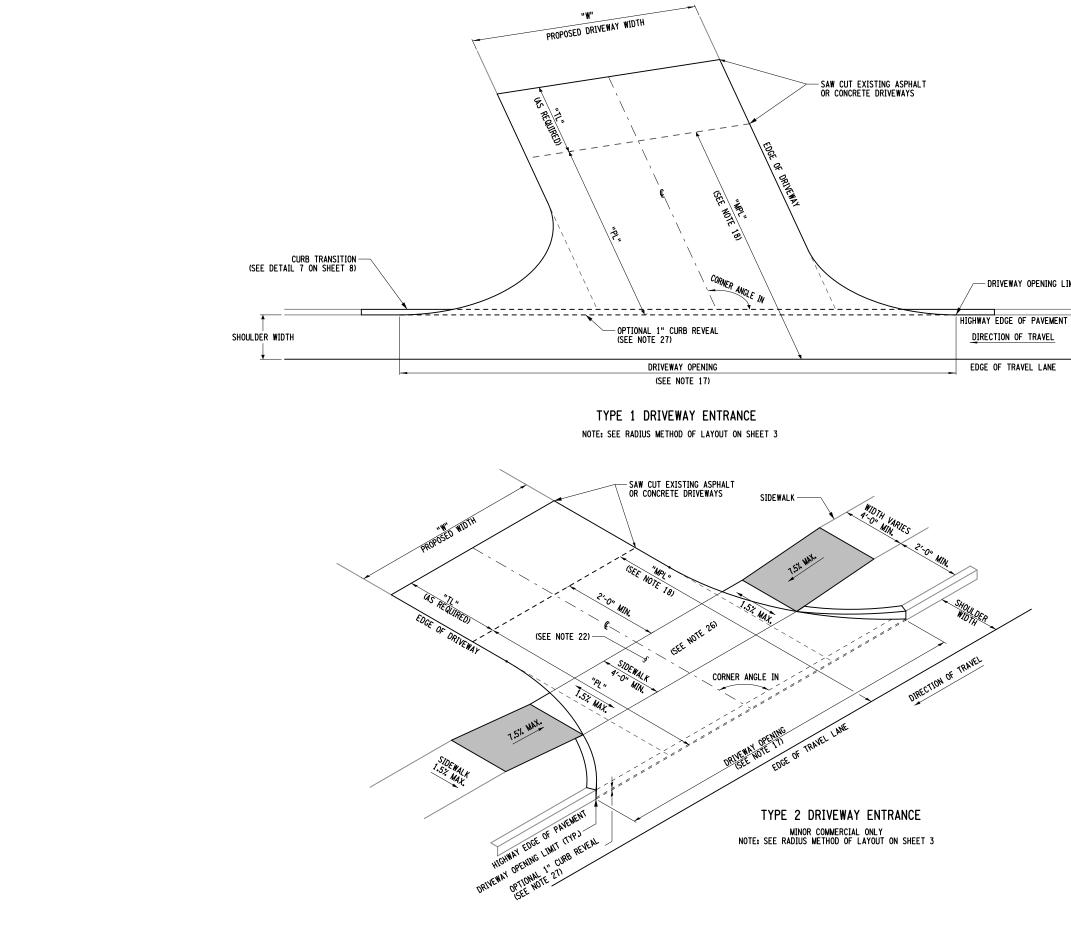
SEE GENERAL NOTE 15.

+

= 10.2' + (10' × 1.07) + 1.6' = 22.5'

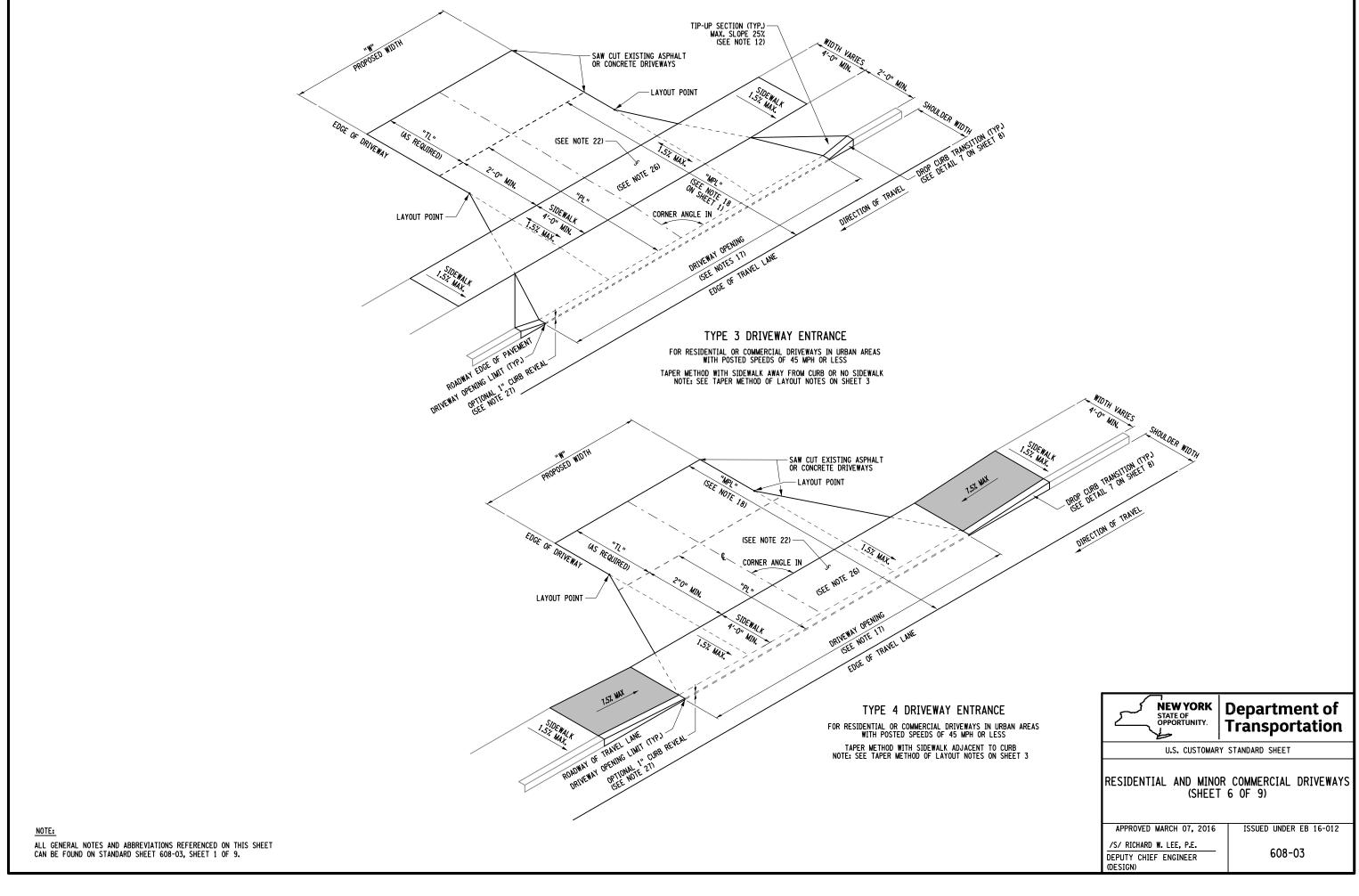
STEP 2. ALONG THE EDGE OF PAYEMENT, MEASURE OUT FROM THE INTERSECTION POINTS AT DISTANCES "Y" IN AND "Y" OUT RESPECTIVELY TO LOCATE THE DRIVEWAY OPENING LIMITS.



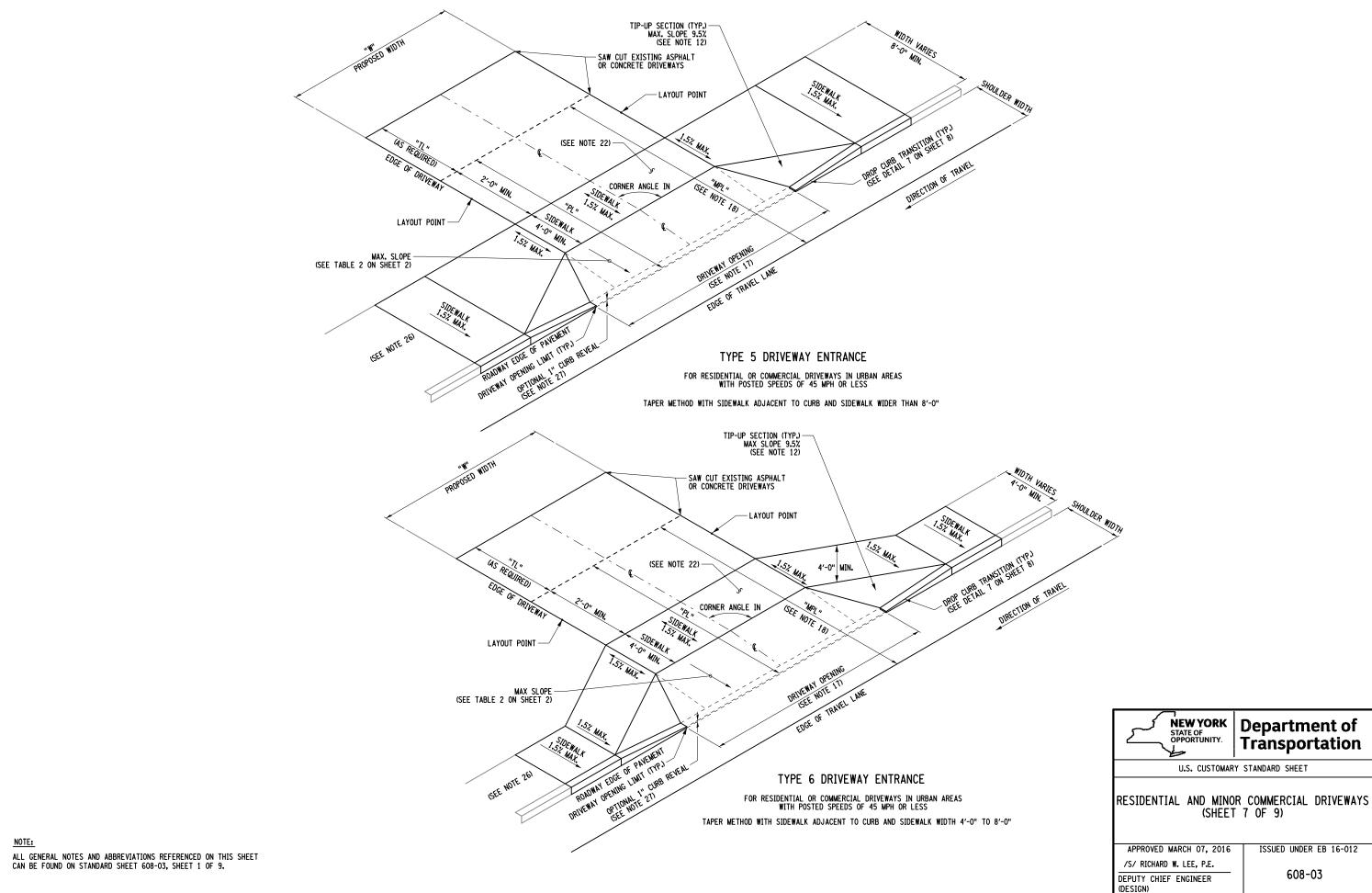


NOTE: ALL GENERAL NOTES AND ABBREVIATIONS REFERENCED ON THIS SHEET CAN BE FOUND ON STANDARD SHEET 608-03, SHEET 1 OF 9. DRIVEWAY OPENING LIMIT (TYP.)

| NEW YORK STATE OF OPPORTUNITY. | Department of Transportation | | | | | | |
|---|-----------------------------------|--|--|--|--|--|--|
| U.S. CUSTOMARY STANDARD SHEET | | | | | | | |
| | R COMMERCIAL DRIVEWAYS 5 OF 9) | | | | | | |
| APPROVED FEBRUARY 5, 2020 | ISSUED UNDER EI 20-005 | | | | | | |
| /S/ RICHARD D. WILDER, P.E. DEPUTY CHIEF ENGINEEER (DESIGN) | 608-03 | | | | | | |



FILE NAME = 608-0306.don DATE/TIME = 08-MAR-2016 14:56 H USER = Imontgomery



FILE NAME = 608-0307.dgn DATE/TIME = 08-MAR-2015 15:39 + USER = lmontgomery

PAVING LIMITS (SEE NOTE 18) SHOULDER - SHOULDER BUFFER (SEE NOTE 21) PROPOSED FINISHED GRADE TRAVEL LANE TRAVEL LANE SIDEWALK 4'-0" MIN. - Lc (SEE NOTE 23) VARIES VARIES 8.0% MAX. 8.0% MAX. G1 (SEE TABLE 5 ON SHEET 2) 1.5% MAX. 8.0% MAX. 8.0% MAX. 2.24 Γ SLOPE VARIES (SEE TABLE 2 ON SHEET 2) EXISTING GROUND GRADE SLOPE VARIES (SEE TABLE 2 ON SHEET 2) -EXISTING GROUND ALGEBRAIC CHANGE IN GRADE A = I G2-G1 I DETAIL 2 DRIVEWAY PROFILE FOR UNCURBED HIGHWAY WITH SIDEWALK DETAIL 1 DRIVEWAY PROFILE FOR UNCURBED HIGHWAY WITH SIDEWALK IN CUT SECTION WITH ROADSIDE DITCH IN FILL SECTION WITHOUT ROADSIDE DITCH PAVING LIMITS (SEE NOTE 18) CURB & GUTTER -Lc (SEE NOTE 23) - CURB & GUTTER TRAVEL LANE BUFFER (SEE NOTE 21) - PROPOSED FINISHED TRAVEL LANE SIDEWALK VARIES Ls 8.0% MAX. GRADE (SEE NOTE 23) G2 (SEE TABLE 5 ON SHEET 2) 4'-0" MIN. G1 (SEE TABLE 5 ON SHEET 2) VARIES 1.5% MAX. 8.0% MAX. 1 DROP CURB 1" REVEAL (SEE NOTE 27) $\Gamma \equiv \Xi$ ALGEBRAIC CHANGE IN GRADE

A = | G2-G1 |

TRANSITION LENGTH

2'-0" MIN.

SAW CUT (SEE NOTE 25)

SLOPE VARIES

(SEE TABLE 2 ON SHEET 2)

DETAIL 3 DRIVEWAY PROFILE FOR CURBED SECTION WITH SIDEWALK IN CUT SECTION

SLOPE VARIES (SEE TABLE 2 ON SHEET 2)

SEE NOTE 24

SIDEWALK WIDTH

4'-0" MIN.

1.5% MAX.

- EXISTING DRIVEWAY PROFILE

DETAIL 5

DRIVEWAY RECONSTRUCTION PROFILE

FOR NEW SIDEWALK CONSTRUCTION ACROSS EXISTING DRIVEWAY IN CUT SECTION OR WITH CURB AND CLOSED DRAINAGE

BUFFER

(SEE NOTE 21)

SLOPE VARIES (SEE TABLE 2 ON SHEET 2)

DROP CURB 1" REVEAL (SEE NOTE 27)

CURB/EDGE OF SHOULDER

SAW CUT (SEE NOTE 25)

PAVING LIMITS (SEE NOTE 18)

G1

Ls

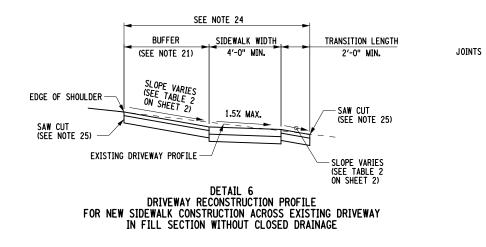
(SEE NOTE 23)

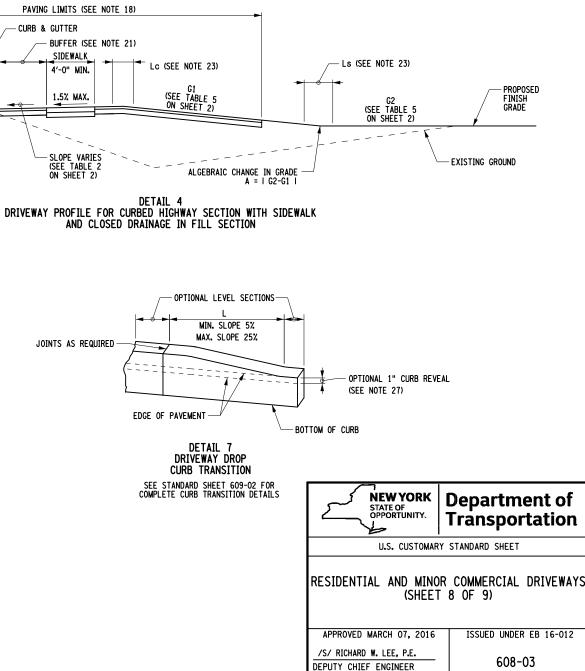
BUFFER (SEE NOTE 21)

SIDEWALK

4'-0" MIN.

1.5% MAX.





(DESIGN)

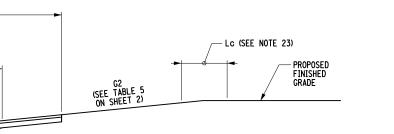


NOTES:

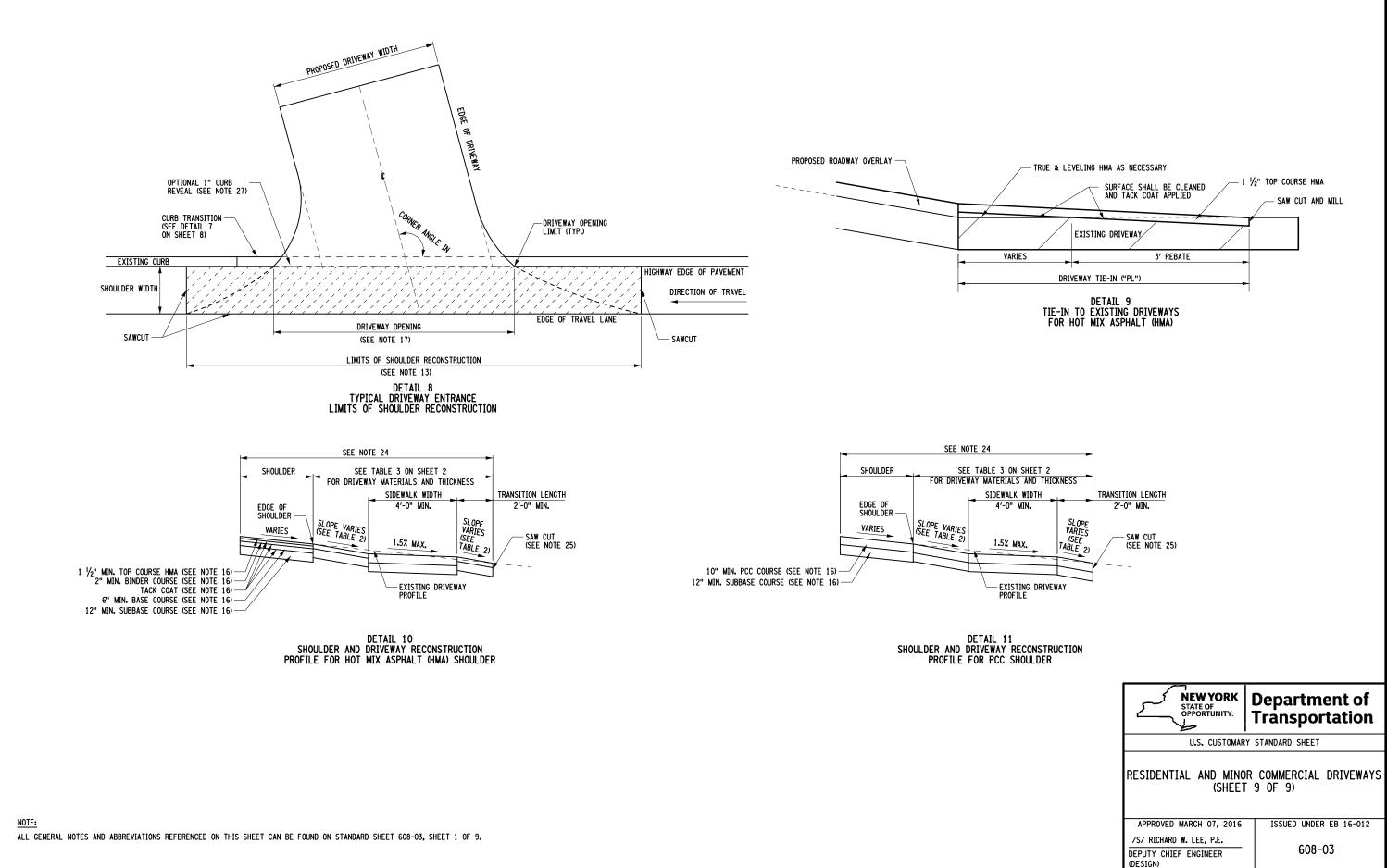
ALL GENERAL NOTES AND ABBREVIATIONS REFERENCED ON THIS SHEET CAN BE FOUND ON STANDARD SHEET 608-03, SHEET 1 OF 9.

DETAILS SHOWN ON THIS SHEET SHALL BE USED FOR RESIDENTIAL AND MINOR COMMERCIAL DRIVEWAYS ONLY, CURB RAMPS SHALL BE USED AT MAJOR COMMERCIAL DRIVEWAYS, PUBLIC HIGHWAYS, AND STREETS. REFER TO SHEET 1 FOR THE DEFINITION OF MAJOR AND MINOR COMMERCIAL DRIVEWAYS.

= 608-0308.dgn = 08-MAR-2016 14:59 = 1montgomery FILE NAME DATE/TIME USER

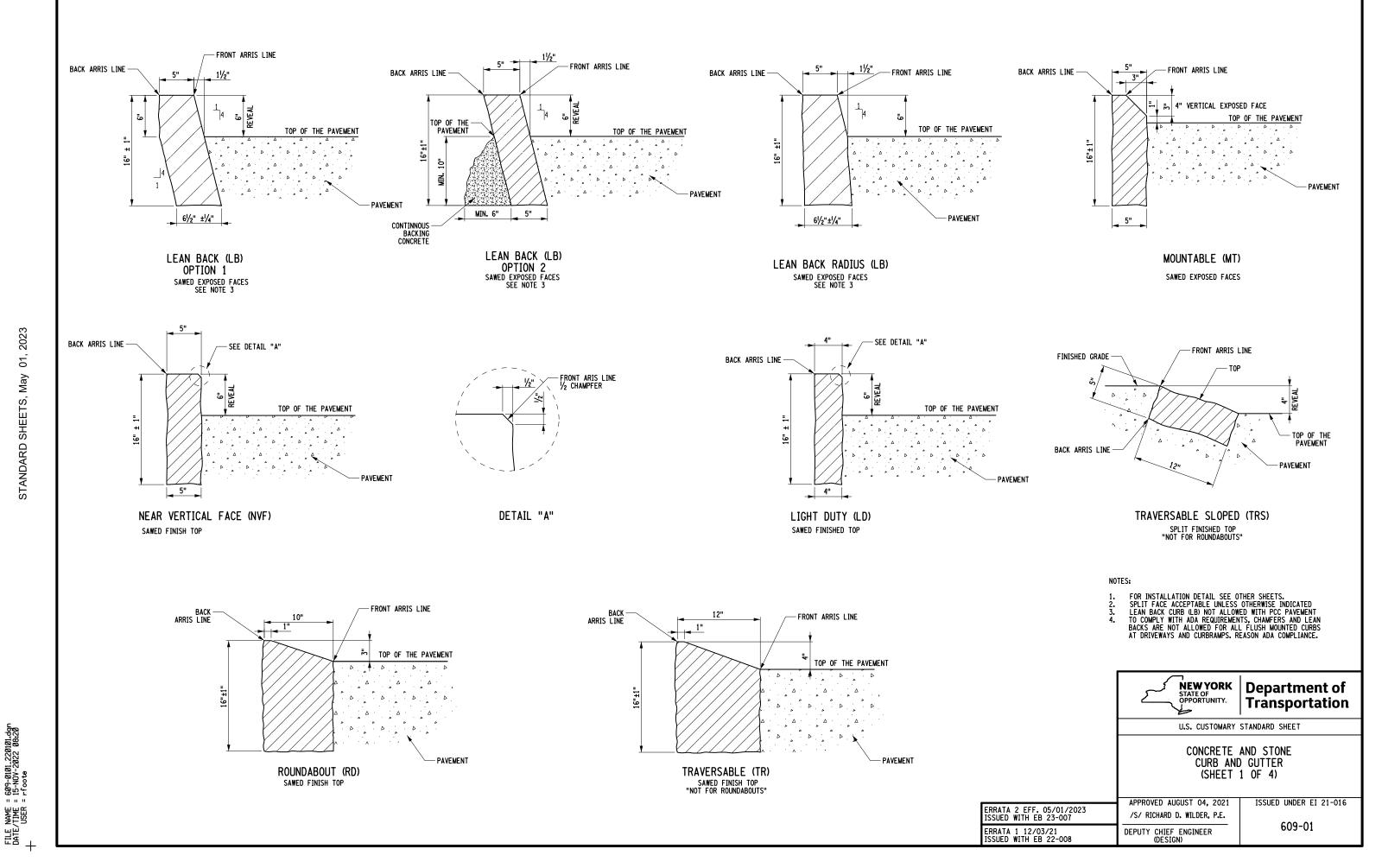


- ALGEBRAIC CHANGE IN GRADE A = I G2-G1 ICULVERT WITH END SECTIONS

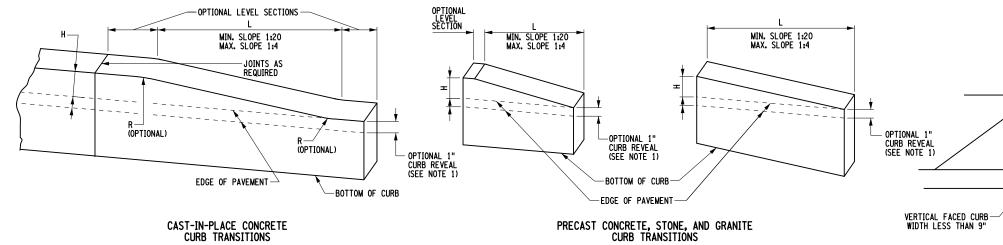


+

FILE NAME = 608-0309.don DATE/TIME = 08-MAR-2016 15:00 + USER = lmontgomery



01, 2023 STANDARD SHEETS, May



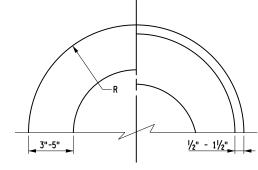
(SEE NOTE 2)

| CURB TRANSITION LENGTHS (L) | | | | |
|-----------------------------|-----|------|------|--|
| H | 1:4 | 1:12 | 1:20 | |
| 4" | 16" | 48" | 80" | |
| 6" | 24" | 72" | 120" | |

| CURB TRANSITION LENGTHS (L) WITH CURB REVEAL | | | | |
|---|-----|------|------|--|
| H SLOPE | 1:4 | 1:12 | 1:20 | |
| 4" | 12" | 36" | 60" | |
| 6" | 20" | 60" | 100" | |

(SEE NOTE 2)

| | CURB FACE |
|---|-----------|
| R | |



BULLNOSE

MOUNTABLE CURB

VERTICAL FACED CURB



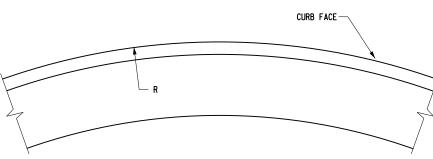
R

3"-5" MIN.

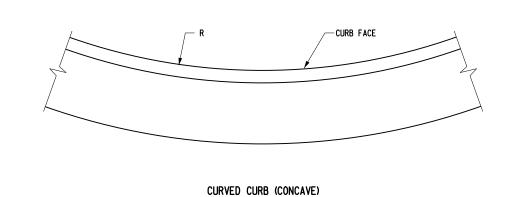
Ţ

MAX.

MAX. MIN. 7 ۍ

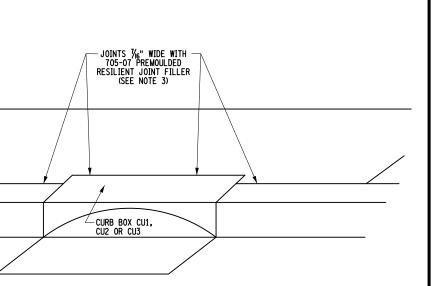


CURVED CURB (CONVEX)



FILE NAME = 609-0102.don DATE/TIME = 16-SEP-2021 09:19 + USER = rfoote

+



CURB AND CURB BOX ADJACENT TO CONCRETE SIDEWALK (NOT ON STRUCTURES)

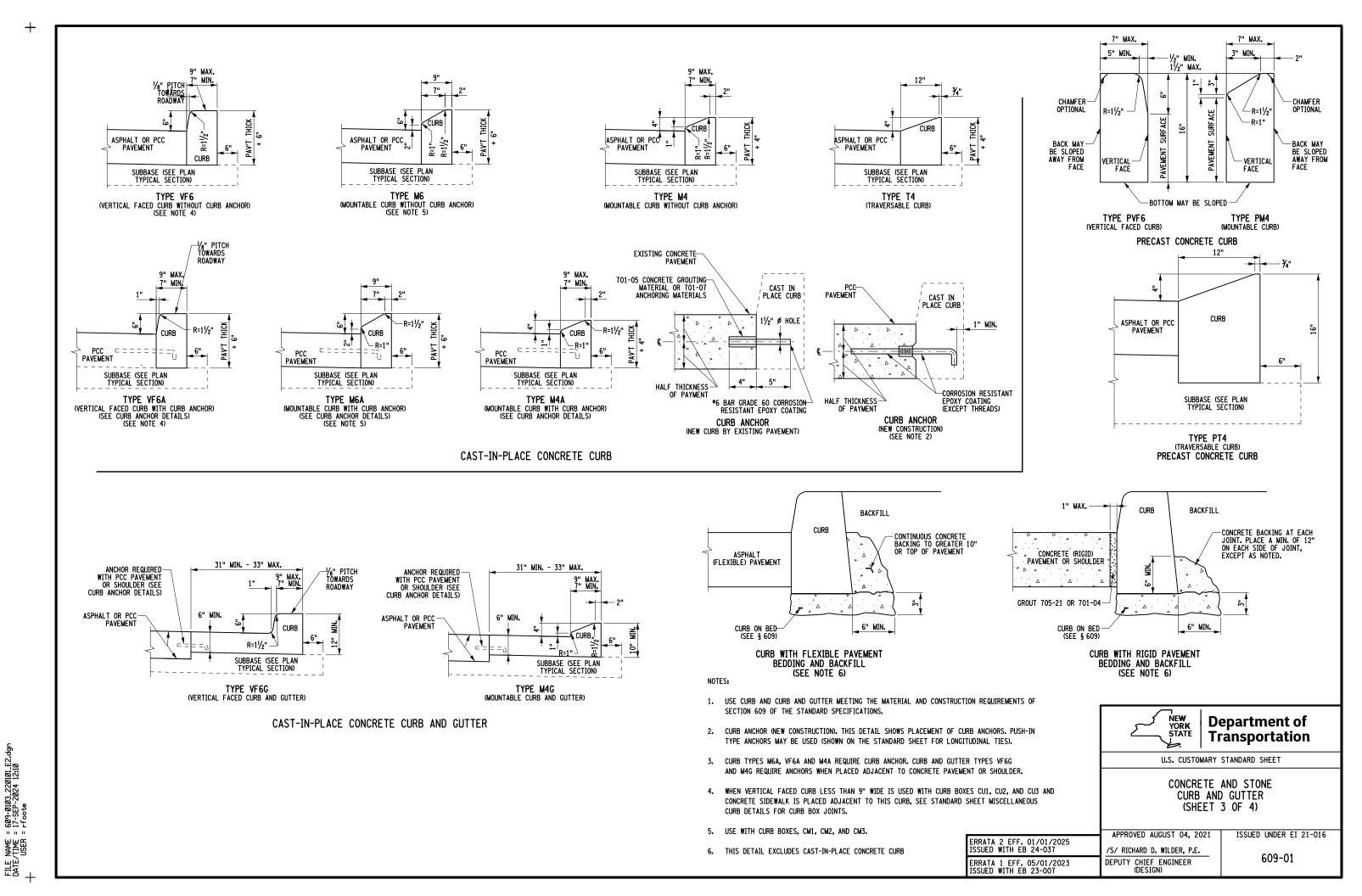
| STANDARD PRECAST CURB RADII IN INCHES |
|--|
| 12" BULLNOSE * |
| 18" BULLNOSE * |
| 24" HALF BULLNOSE* |
| 30" HALF BULLNOSE |
| 60" |
| 72" * |
| 120" |
| 180" |
| 240" |
| 300" |
| 360" |
| 420" * |
| 480" |
| 540" * |
| 600" |
| 720" |
| 840" |
| 960" |
| 1080" |

• NOT ALL PRECASTERS MANUFACTURE THESE RADII

NOTES:

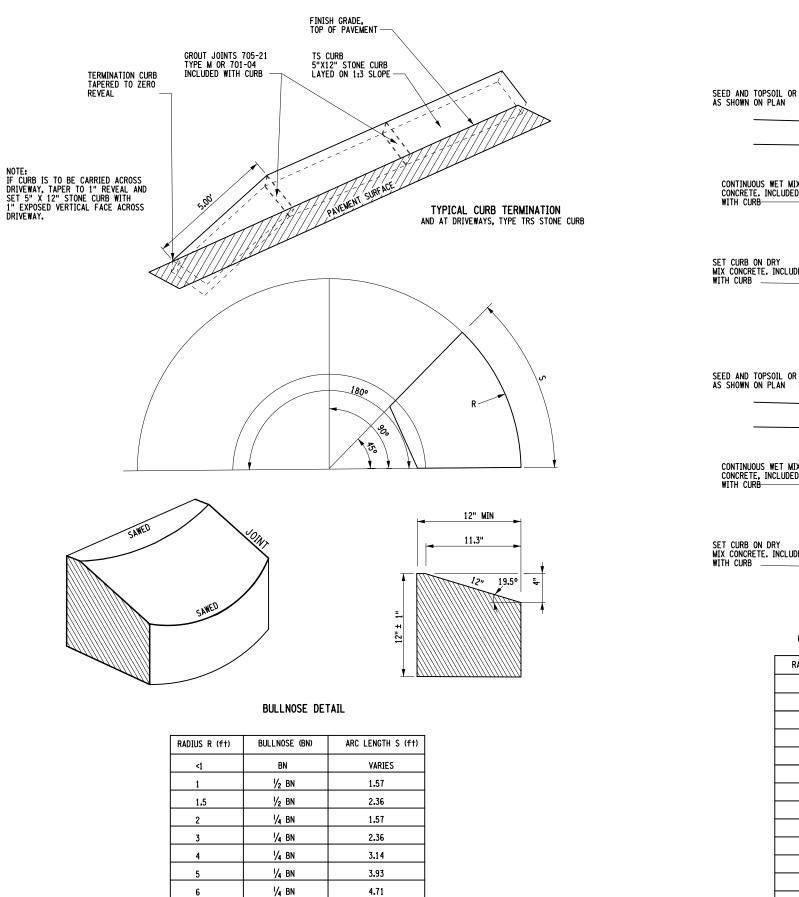
- 1. USE 1" REVEAL AND CONTINUE CURB ACROSS DRIVEWAY ENTRANCES ONLY IF SHOWN IN THE CONTRACT DOCUMENTS, OR DIRECTED BY THE ENGINEER AS A FIELD CONDITION.
- 2. TERMINATE CURB, CURB AND GUTTER BY TRANSITIONING ON A MAXIMUM SLOPE OF 1:12 TO PAVEMENT SURFACE.
- EXTEND JOINT FILLER 6" MINIMUM BEHIND CURB ON BOTH SIDES OF CURB BOX. 705-07 NOT NEEDED WHEN VERTICAL FACED CURB WIDTH EQUAL TO WIDTH OF CURB BOX.

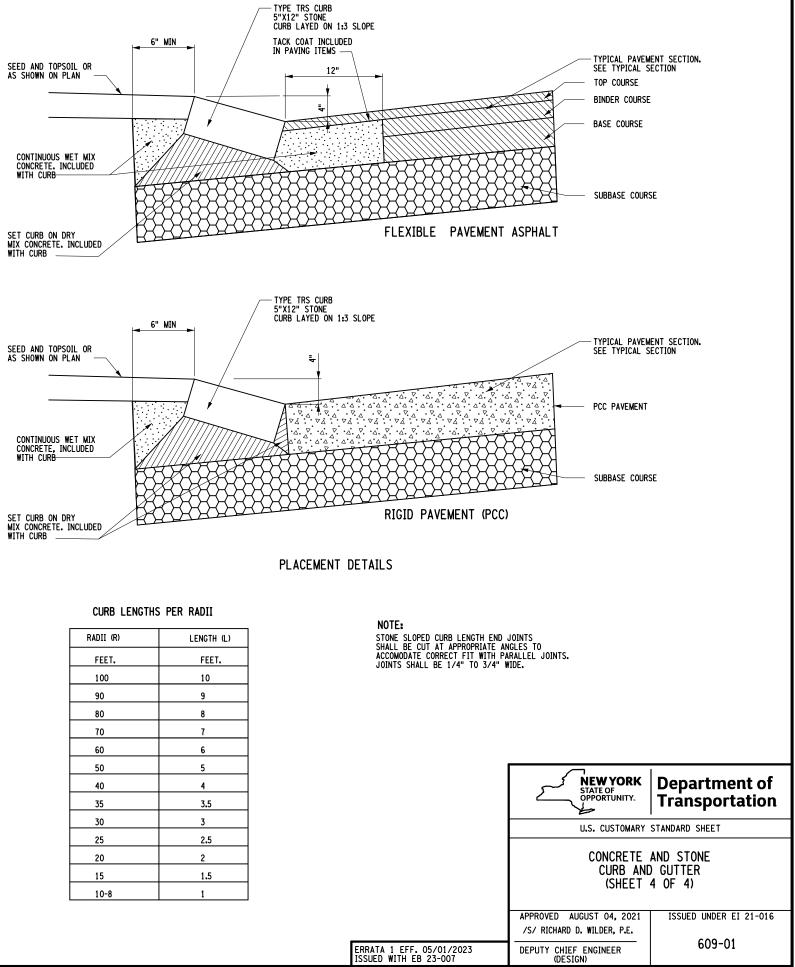
| NEW YORK STATE OF OPPORTUNITY. | Department of Transportation | | |
|--|---------------------------------|--|--|
| U.S. CUSTOMARY | STANDARD SHEET | | |
| CONCRETE AND STONE CURB AND GUTTER (SHEET 2 OF 4) | | | |
| APPROVED AUGUST 04, 2021 | ISSUED UNDER EI 21-016 | | |
| /S/ RICHARD D. WILDER, P.E. DEPUTY CHIEF ENGINEER (DESIGN) | 609-01 | | |





NOTE:







| RADII (R) | LENGTH (L) |
|-----------|------------|
| FEET. | FEET. |
| 100 | 10 |
| 90 | 9 |
| 80 | 8 |
| 70 | 7 |
| 60 | 6 |
| 50 | 5 |
| 40 | 4 |
| 35 | 3.5 |
| 30 | 3 |
| 25 | 2.5 |
| 20 | 2 |
| 15 | 1.5 |
| 10-8 | 1 |
| | |

2023 9, May SHEETS, STANDARD

7

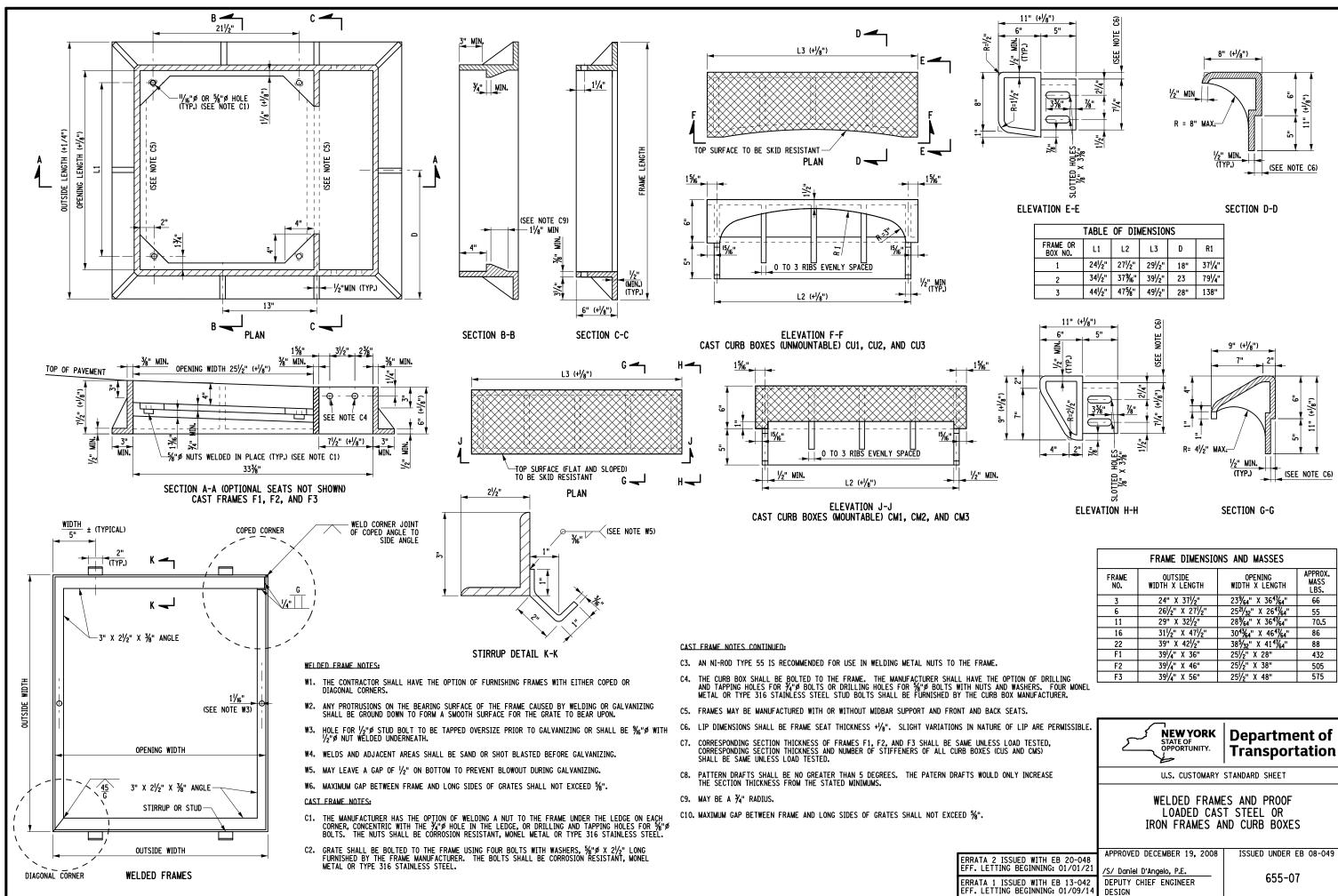
8

¼ BN

1∕4 BN

5.50

6.28

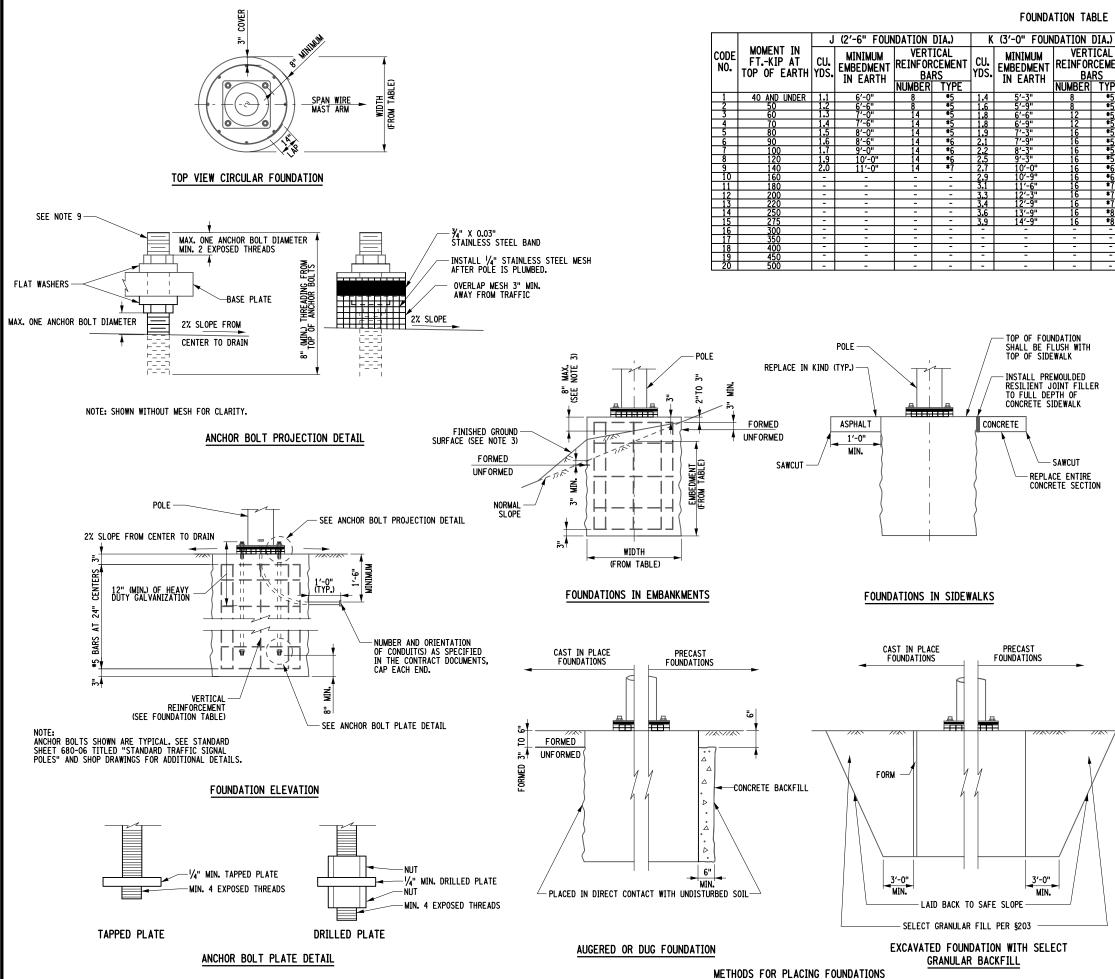


: = 655-07_050709e2.dc = 07-0CT-2020 10:11 : rfoote FILE NAME = DATE/TIME = USER =

| ELE | VATION | H-H |
|-----|--------|-----|
|-----|--------|-----|

| FRAME DIMENSIONS AND MASSES | | | | | |
|-----------------------------|---------------------------|--|-------------------------|--|--|
| FRAME NO. | OUTSIDE WIDTH X LENGTH | OPENING WIDTH X LENGTH | APPROX. MASS LBS. | | |
| 3 | 24" X 371/2" | 23%4" X 364%4" | 66 | | |
| 6 | 261/2" X 271/2" | 25 ² / ₃₂ " X 26 ⁴ / ₆₄ " | 55 | | |
| 11 | 29" X 321/2" | 28%4" X 364%4" | 70.5 | | |
| 16 | 311/2" X 471/2" | 30 ⁴ 364" X 46 ⁴ 764" | 86 | | |
| 22 | 39" X 421/2" | 38 ⁵ / ₃₂ " X 41 ⁴ / ₆₄ " | 88 | | |
| F1 | 391⁄4" X 36" | 25 ¹ /2" X 28" | 432 | | |
| F2 | 391/4" X 46" | 251/2" X 38" | 505 | | |
| F3 | 391⁄4" X 56" | 25 ¹ /2" X 48" | 575 | | |
| • | • | • | | | |

| | APPROVED DECEMBER 19, 2008 | ISSUED UNDER EB 08-049 |
|----------------------------|----------------------------|------------------------|
| 2 ISSUED WITH EB 20-048 | ····· | |
| ETTING BEGINNING: 01/01/21 | /C / Depiel D/Appela D D | |
| | 757 Daniel D'Angelo, P.E. | |
| 1 ISSUED WITH EB 13-042 | DEPUTY CHIEF ENGINEER | 655-07 |
| ETTING BEGINNING: 01/09/14 | | |
| | DESIGN | |



11:19 = 680-01.dgn = 21-SEP-2023 1 = cpalantappan File Name Date/Time User

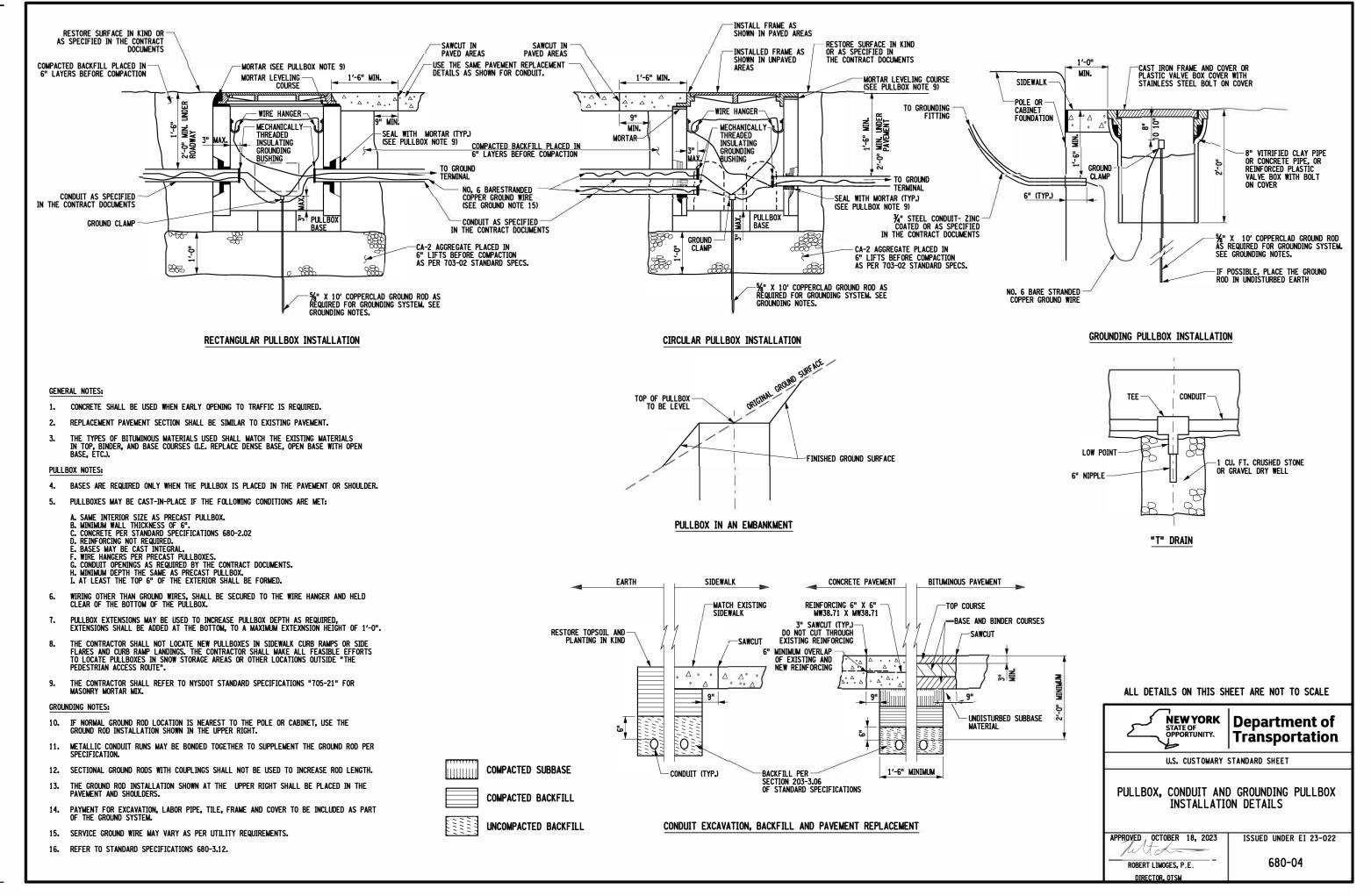
| | _ | | | | | | | |
|-------------|-------------|----------------------------------|-----------------------|---------|-------------|----------------------------------|-----------------------|-----------|
| <i>t.</i>) | L | . (3'-6" FOUN | DATION | DIA.) | N | i (4'-0" foui | DATION | DIA.) |
| AL Iment | CU. Yds. | MINIMUM EMBEDMENT IN EARTH | VERT REINFOR BA | RCEMENT | CU. Yds. | MINIMUM EMBEDMENT IN EARTH | VERT REINFOR BA | CEMENT |
| YPE | | | NUMBER | TYPE | | | NUMBER | TYPE |
| *5 | - | - | - | - | 1 | - | - | - |
| *5 | 1.9 | 5′-4" | 8 | *5 | 2.4 | 5′-0" | 8 | *5 |
| *5 | 2.1 | 5′-10" | 12 | *5 | 2.6 | 5'-6" | 8 | *5 |
| * 5 | 2.4 | 6'-6" | 12 | *5 | 2.8 | 6′-0" | 12 | *5 |
| *5 | 2.5 | 6'-9" | 12 | *5 | 3.1 | 6'-6" | 12 | *5 |
| *5 | 2.6 | 7′-3" | 16 | *5 | 3.2 | 6'-9" | 12 | *5 |
| *5 | 2.7 | 7'-6" | 16 | *5 | 3.3 | 7'-0" | 16 | *5 |
| *5 | 3.0 | 8'-3" | 16 | *5 | 3.7 | 7′-9" | 16 | *5 |
| *6 | 3.3 | 9'-3" | 16 | *5 | 4.0 | 8′-6" | 16 | *5 |
| *6 | 3.5 | 9′-9" | 16 | *6 | 4,2 | 9′-0" | 16 | *5 |
| *7 | 3.8 | 10'-6" | 16 | *6 | 4.6 | 9′-3" | 16 | *5 |
| *7 | 4.1 | 11'-3" | 16 | *6 | 4.8 | 10'-3" | 16 | *6 |
| * 7 | 4.2 | 11'-9" | 16 | *7 | 5.1 | 10'-9" | 16 | *6 |
| *8 | 4.6 | 12′-10" | 16 | *7 | 5.5 | 11'-9" | 16 | #7 |
| *8 | 4.9 | 13'-6" | 16 | *8 | 5.9 | 12'-6" | 16 | *7 |
| - | 1 | - | - | - | 6.1 | 13'-0" | 16 | *8 |
| - | - | - | - | - | 6.7 | 14'-4" | 16 | *8 *10 |
| - | - | - | - | - | 7.2 | 15'-6" | 16 | *10 |
| - | - | - | - | - | 7.8 | 16'-9" | 19 | *10 |
| - | - | - | - | - | 8.4 | 18'-0" | 21 | *10 |

GENERAL NOTES:

- FOUNDATION CAPACITY IN FOOT-KIPS WILL BE SPECIFIED IN THE CONTRACT DOCUMENTS, FOUNDATION WIDTH AND EMBEDMENT SHALL BE DETERMINED FROM THE TABLE BY THE CONTRACTOR AND APPROVED BY THE ENGINEER BEFORE INSTALLATION. 1.
- FOUNDATION EMBEDMENT IN EMBANKMENTS SHALL BE MEASURED FROM THE NORMAL SLOPE (ORIGINAL GRADE) AS SHOWN IN FOUNDATIONS IN EMBANKMENTS DETAIL. 2.
- ADJUST THE FINISHED GROUND SURFACE IN THE VICINITY OF THE FOUNDATION AS NECESSARY SO THAT NO FILL SPILLS ON THE TOP OF THE FOUNDATION. FOR FOUNDATIONS IN EMBANKMENTS, THE MAXIMUM DISTANCE FROM THE TOP OF 3. FOUNDATION TO THE FINISHED GROUND AT THE CENTERLINE SHALL NOT EXCEED 8".
- 4. PAYMENT QUANTITY FOR POLE EXCAVATION AND CONCRETE FOUNDATION IS THE CUBIC YARDS OF CONCRETE SPECIFIED IN THE FOUNTDATION TABLE.
- WHEN A FOUNDATION IS USED WITH A BREAKAWAY TYPE OF POLE BASE, THE MAXIMUM DISTANCE FROM THE SURROUNDING SURFACE TO THE TOP OF ANCHOR BOLTS SHALL 5. BE 4".
- THE GEOTECHNICAL ENGINEERING BUREAU AND THE OFFICE OF STRUCTURES SHOULD BE CONSULTED UNDER THE FOLLOWING CIRCUMSTANCES: 6.

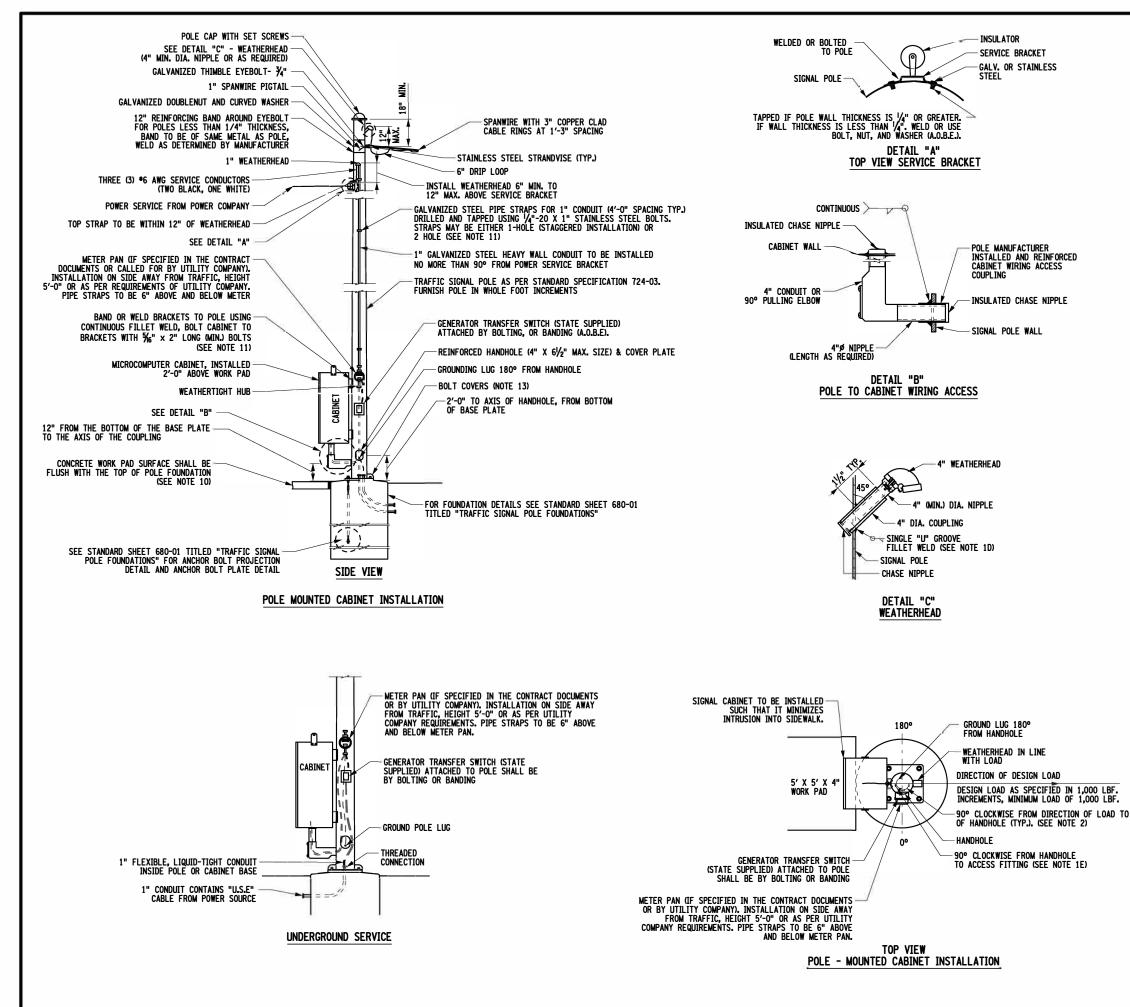
 - FOUNDATION IS PLACED IN SOFT CLAY OR ORGANIC DEPOSITS. MOMENT AT THE TOP OF EARTH IS GREATER THAN 500 FOOT KIPS. GROUNDWATER ELEVATION IS ABOVE BOTTOM OF FOUNDATION OR SHAFT.
- IF UNANTICIPATED SOUND ROCK IS ENCOUNTERED WITHIN ONE DIAMETER OF THE BOTTOM OF A SHAFT EXCAVATION, USE THE FULL SHAFT LENGTH. IF UNANTICIPATED SOUND ROCK IS ENCOUNTERED AT HIGHER ELEVATIONS, THE TOTAL SHAFT LENGTH SHALL BE DECREASED SUCH THAT THE SHAFT PENETRATES A MINIMUM OF I DIA. INTO SOUND ROCK. HOWEVER, THE TOTAL EMBEDMENT SHALL NOT BE LESS THAN 1 DIA. PLUS 2'-O". ALL CHANGES TO SHAFT LENGTH MUST BE APPROVED AND AS ORDERED BY THE FORUMEER 7. BY THE ENGINEER.
- BOLT COVERS SHALL BE USED ONLY WHEN SPECIFIED IN THE CONTRACT DOCUMENTS. 8.
- ANCHOR BOLTS SHALL BE HOT-DIPPED GALVANIZED A MINIMUM OF THE TOP $12^{\prime\prime}$ and threaded a minimum of $8^{\prime\prime}.$ 9.
- AT LEAST ONE TEST PIT PER SIGNAL POLE FOUNDATION SHALL BE INCLUDED IN THE CONTRACT DOCUMENTS, TO BE PAID FOR UNDER APPROPRIATE ITEM NUMBER. THE CONTRACTOR SHALL BE PAID FOR THE NUMBER OF TEST PITS EXCAVATED AS 10. NECESSARY TO LOCATE THE FINAL FOUNDATION LOCATION.

| ALL DETAILS ON THIS SHEET ARE NOT TO SCALE | | | | |
|--|---------------------------------|--|--|--|
| NEW YORK STATE OF OPPORTUNITY. | Department of Transportation | | | |
| U.S. CUSTOMARY STANDARD SHEET | | | | |
| TRAFFIC SIGNAL POLE FOUNDATIONS | | | | |
| APPROVED OCTOBER 18, 2023 | ISSUED UNDER EI 23-022 | | | |
| RICHARD D. WILDER, P.E. DEPUTY CHIEF ENGINEER, DESIGN | 680-01 | | | |



FILE NAME = 680-04.dgn DATE/TIME = 21-5EP-2023 10:34 L USER = opalaniappan





680-0501.dgn 21-SEP-2023 cpalaniappan File Name Date/Time +

INSTALLATION NOTES:

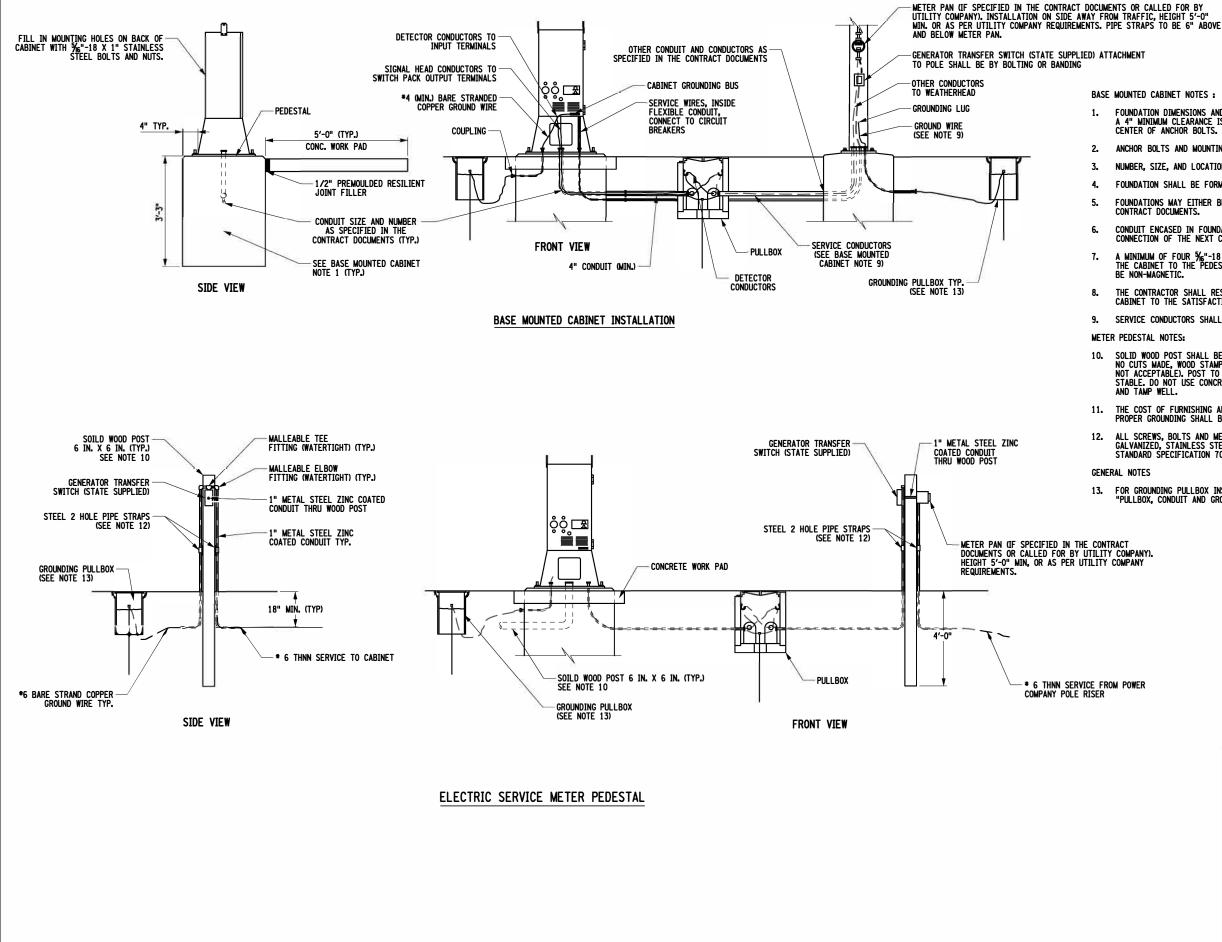
- 1. POLE FITTINGS SHALL MEET THE FOLLOWING REQUIREMENTS:

 - HOLE DIAMETER LESS THAN ½ THE POLE DIAMETER. COUPLINGS SHALL BE HEAVY WALL GALVANIZED PIPE COUPLINGS (A120). HOLES SHALL BE SMOOTHLY FINISHED TO CLOSELY FIT THE COUPLING AROUND ITS ENTIRE CIRCUMFERENCE. Č. D.
 - TIS ENTINE CINCOMPERENCE. COUPLINGS SHALL BE WELDED AROUND ITS ENTIRE CIRCUMFERENCE WITH A FILLET WELD SIZE EQUAL TO THE POLE WALL THICKNESS (5/16" MINIMAL), WELDS TO BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL. THE AXIS OF THE CABINET WIRNG ACCESS SHALL BE LOCATED 90° CLOCKWISE
 - Ε. (TOP VIEW) TO THE AXIS OF THE POLE'S HANDHOLE AND 12" FROM THE BOTTOM OF THE BASE PLATE. IT SHALL BE INSTALLED AND REINFORCED BY THE POLE MANUFACTURER ACCORDING TO SECTION 724-03 OF THE STANDARD SPECIFICATIONS. ALL WELDS SHALL BE FIELD GALVANIZED. F.
- FOR THOSE POLES ON WHICH A TRAFFIC SIGNAL CABINET WILL BE MOUNTED, THE CONTRACTOR SHALL ORIENT THE POLE TO ALIGN THE SIGNAL CABINET WIRING ACCESS HOLE AS SPECIFIED IN THE CONTRACT DOCUMENTS. IF NO ORIENTATION IS SPECIFIED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL LOCATE THE SIGNAL CABINET AND THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL LOCATE THE SIGNAL CABINET AND 2. THE CONTRACT DUCLIMENTS, THE CONTRACTOR SHALL LOCATE THE SIGNATE CHOINENT AND CABINET WIRING ACCESS HOLE 180° FROM THE SPAN WIRE OR LOD ATTACHMENT TO THE POLE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND PROVIDE THE INTENDED POLE ORIENTATION THREE BUSINESS DAYS IN ADVANCE OF DOING ANY POLE FOUNDATION WORK.
- SERVICE CONDUCTORS SHALL NOT BE LOCATED IN PULLBOXES WITH OTHER CONDUCTORS. 3.
- THE NORMAL CONDUIT FOR SERVICE CONDUCTOR SHALL BE 1" GALVANIZED STEEL HEAVY WALL CONDUIT. 4.
- EXPOSED ENDS OF CONDUIT OR FITTINGS SHALL HAVE INSULATING GROUNDING, BUSHING, OR EQUIVALENT. 5.
- IF A METER IS REQUIRED FOR A POLE MOUNTED CABINET, THE METER SHALL BE INSTALLED ON THE POLE. 6.
- THE METER PAN SHALL BE ATTACHED TO THE POLE IN A MANNER SIMILAR TO THAT SHOWN FOR THE POLE MOUNTED CABINET, OR AS REQUIRED BY THE UTILITY COMPANY. 7.
- LOCATE BRACKETS AND ATTACHING BOLTS TO CLEAR EQUIPMENT WITHIN CABINET. 8.
- MOUNTING BRACKET DETAIL MAY VARY DEPENDING UPON CABINET MANUFACTURER. 9.
- 10. IN UNPAVED AREAS A 5' X 5' X 4" CONCRETE WORK PAD SHALL BE INSTALLED IN FRONT OF CABINET DOOR AND SHALL ABUT THE POLE FOUNDATION.
- 11. ALL STAINLESS STEEL BOLTS, NUTS, AND WASHERS SHALL BE NON-MAGNETIC.
- 12. SERVICE GROUND WIRE MAY VARY AS PER UTILITY REQUIREMENTS.
- 13. ANCHOR BOLT COVERS ONLY TO BE USED WHEN SPECIFIED IN THE CONTRACT DOCUMENTS.
- ELECTRICAL AND MECHANICAL TRAFFIC SIGNAL ELEMENTS SUBJECT TO DAMAGE FROM WATER INTRUSTION SHOULD BE PLACED ABOVE THE BASE FLOOD ELEVATION (100-YEAR FLOOD) WHERE PRACTICABLE.

| ۱. | AVIC | |
|----|------|--|
| , | AVIS | |

ALL DETAILS ON THIS SHEET ARE NOT TO SCALE

| NEW YORK STATE OF OPPORTUNITY. | Department of Transportation | | | | |
|---|---------------------------------|--|--|--|--|
| U.S. CUSTOMARY | STANDARD SHEET | | | | |
| POLE, BASE MOUNTED CABINET AND ELECTRIC METER PEDESTAL INSTALLATION DETAILS SHEET 1 OF 2 | | | | | |
| APPROVED OCTOBER 18, 2023 ISSUED UNDER EI 23-022 | | | | | |
| ROBERT LIMOGES, P.E. DIRECTOR, OTSM | 680-05 | | | | |



680-0502.dgn 21-SEP-2023 cpalaniappan FILE NAME DATE/TIME USER

BASE MOUNTED CABINET NOTES :

FOUNDATION DIMENSIONS AND ANCHOR BOLT LOCATIONS AS DETERMINED BY THE PEDESTAL BASE. A 4" MINIMUM CLEARANCE IS REQUIRED FROM THE OUTSIDE EDGE OF THE FOUNDATION TO THE CENTER OF ANCHOR BOLTS.

ANCHOR BOLTS AND MOUNTING HARDWARE AS REQUIRED BY THE CABINET MANUFACTURER.

NUMBER, SIZE, AND LOCATION OF CONDUIT AS REQUIRED BY THE CONTRACT DOCUMENTS.

FOUNDATION SHALL BE FORMED TO AT LEAST 6" BELOW THE GROUND SURFACE.

FOUNDATIONS MAY EITHER BE CAST IN PLACE OR PRECAST UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.

CONDUIT ENCASED IN FOUNDATION SHALL EXTEND OUTSIDE THE FOUNDATION ENOUGH TO ALLOW CONNECTION OF THE NEXT CONDUIT SECTION.

A MINIMUM OF FOUR $\frac{5}{16}$ "-18 X 2" LONG STAINLESS STEEL BOLTS SHALL BE USED TO ATTACH THE CABINET TO THE PEDESTAL BASE. ALL STAINLESS STEEL BOLTS, NUTS AND WASHERS SHALL BE NON-MAGNETIC.

THE CONTRACTOR SHALL RESTORE ALL SURFACES SURROUNDING THE BASE OF GROUND MOUNTED CABINET TO THE SATISFACTION OF THE ENGINEER.

9. SERVICE CONDUCTORS SHALL NOT BE LOCATED IN PULLBOXES WITH OTHER CONDUCTORS.

METER PEDESTAL NOTES:

SOLID WOOD POST SHALL BE FULLY PRESSURE TREATED PER STANDARD SPECIFICATION 708-31, NO CUTS MADE, WOOD STAMP VISIBLE FOR ACCEPTANCE (MULTIPLE BOARDS NAILED TOGETHER ARE NOT ACCEPTABLE), POST TO BE SET 4'-O" DEPTH IN GROUND AND MAINTAINED PLUMB AND STABLE, DO NOT USE CONCRETE, BACKFILL POSTHOLE WITH CRUSHED STONE OR WASHED GRAVEL AND TAMP WELL

THE COST OF FURNISHING AND INSTALLING THE METER SOCKET AND MATERIALS TO ESTABLISH PROPER GROUNDING SHALL BE PAID UNDER APPROPRIATE ITEM NUMBERS.

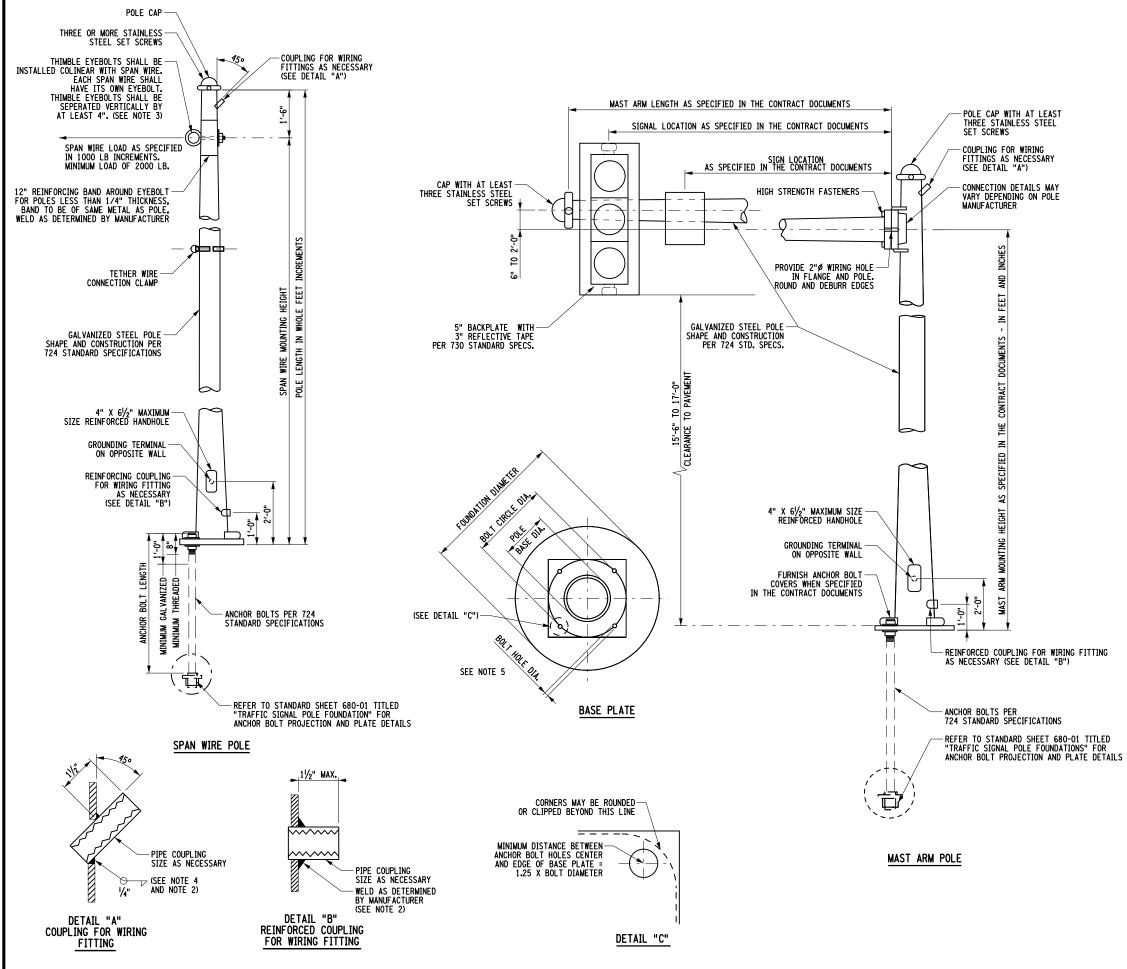
ALL SCREWS, BOLTS AND METAL CONNECTIONS TO THE METER PEDESTAL SHALL BE HOT DIPPED GALVANIZED, STAINLESS STEEL OR OTHERWISE COMPATIBLE WITH PRESSURE TREATED LUMBER PER STANDARD SPECIFICATION 708-31.

GENERAL NOTES

13. FOR GROUNDING PULLBOX INSTALLATION DETAILS, SEE STANDARD SHEET 680-04 TITLED "PULLBOX, CONDUIT AND GROUNDING PULLBOX INSTALLATION DETAILS".

| ALL | DETAILS | IN | THIS | SHEET | ARE | NOT | T0 | SCALE | |
|-----|---------|----|------|-------|-----|-----|----|-------|--|
|-----|---------|----|------|-------|-----|-----|----|-------|--|

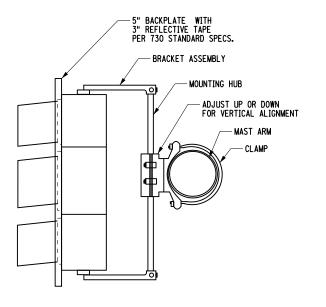
| NEW YORK STATE OF OPPORTUNITY. | Department of Transportation | | | | |
|---|---------------------------------|--|--|--|--|
| U.S. CUSTOMARY | STANDARD SHEET | | | | |
| POLE, BASE MOUNTED CABINET AND ELECTRIC METER PEDESTAL INSTALLATION DETAILS SHEET 2 OF 2 | | | | | |
| APPROVED OCTOBER 18, 2023 | ISSUED UNDER EI 23-022 | | | | |
| ROBERT LIMOGES, P.E. DIRECTOR, OTSM | 680-05 | | | | |



11:20 = 680-06.dgn = 21-SEP-2023 1 = cpalantappan FILE NAME DATE/TIME USER

NOTES:

- POST TOP MOUNT AND BRACKET MOUNT POLES SHALL BE DESIGNED FOR A MINIMUM LOAD OF 2000 LBS. UNLESS ANOTHER LOAD CONFIGURATION IS SPECIFIED IN THE 1. CONTRACT DOCUMENTS.
- 2. ALL POLE WELDS SHALL BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL.
- CIRCUMFERENTIAL POLE CLAMPS, AS AN ALTERNATE TO GALVANIZED THIMBLE EYE BOLTS, MAY BE USED TO CONNECT SPAN WIRE(S) TO THE TOPS OF POLYGONAL SHAPED SIGNAL POLES. HOWEVER, ONLY GALVANIZED THIMBLE EYE BOLTS SHALL BE USED FOR CONNECTING SPAN WIRE(S) TO ROUND SIGNAL POLES. IN EITHER CASE, THE DESIGN LOAD OF THE CONNECTING HARDWARE SHALL BE CERTIFIED TO BE NO MORE TUAN TO REPORT TO THE STRENGT 3. THAN 70 PERCENT OF ITS YIELD STRENGTH.
- 4. ALL AROUND SINGLE "U" GROOVE FILLET WELD.
- REFER TO STANDARD SHEET 680-01 TITLED "TRAFFIC SIGNAL POLE FOUNDATION" FOR 5. FOOTING FOUNDATION DETAILS.
- THE NUMBER OF SIGNALS AND SIGNS SHALL BE SPECIFIED IN THE CONTRACT 6. DOCUMENTS.
- ALL SIGNAL AND SIGN LOCATIONS WILL BE SPECIFIED IN THE CONTRACT DOCUMENTS AS THE DISTANCE FROM THE CENTER OF THE SIGNAL OR SIGN TO THE FLANGE END OF THE MAST ADD 7. OF THE MAST ARM.
- SIGNAL AND SIGN WEIGHT AND PROJECTED AREA AS SPECIFIED IN THE CONTRACT 8. DOCUMENTS.
- THE MAST ARM SHALL BE DESIGNED FOR TYPE OF SIGNAL HEAD MOUNTING BRACKET 9. SHOWN.

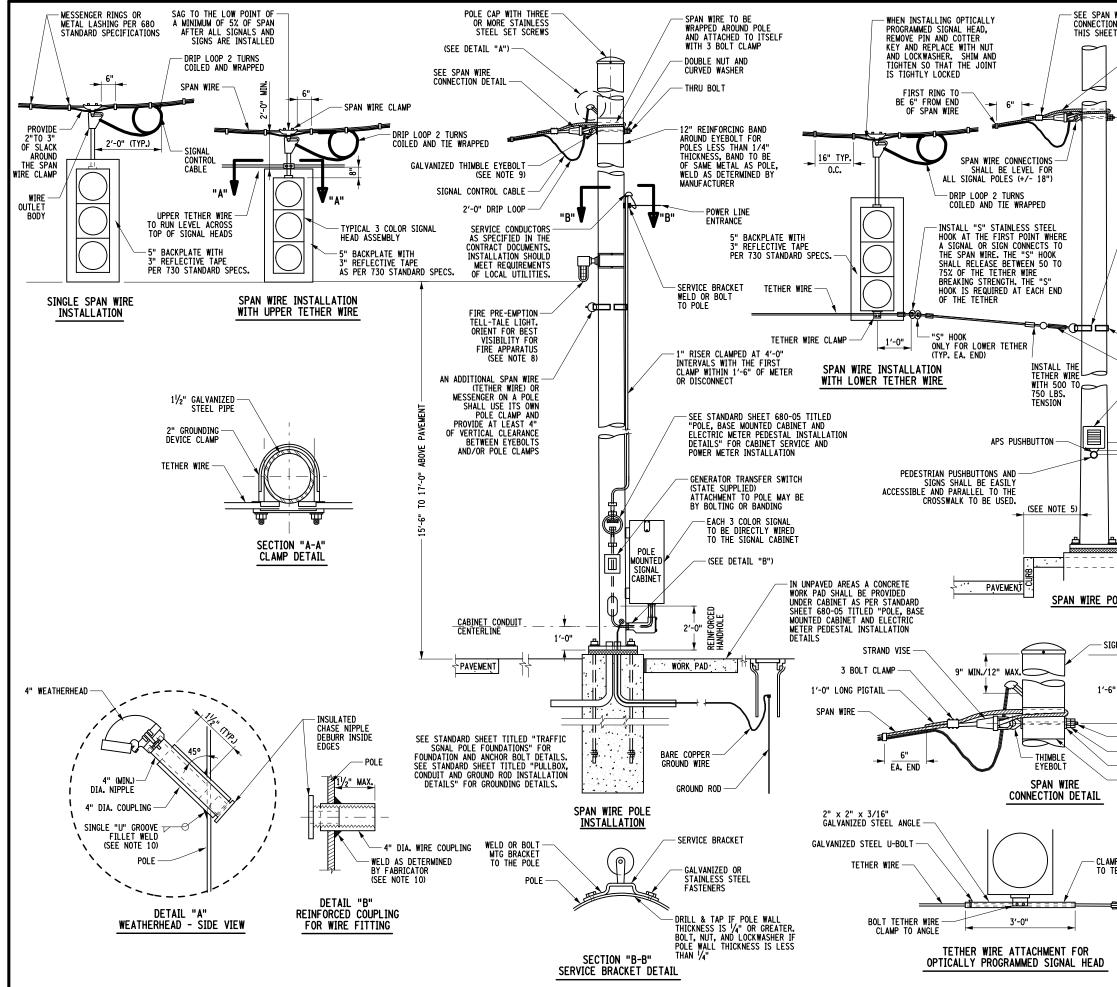


NOTE: USE APPROPRIATE BRACKET ASSEMBLY FOR FIVE SECTION OR MULTI-FACE SIGNALS

SIDE VIEW OF TYPICAL SIGNAL HEAD MOUNTING BRACKET

ALL DETAILS ON THIS SHEET ARE NOT TO SCALE

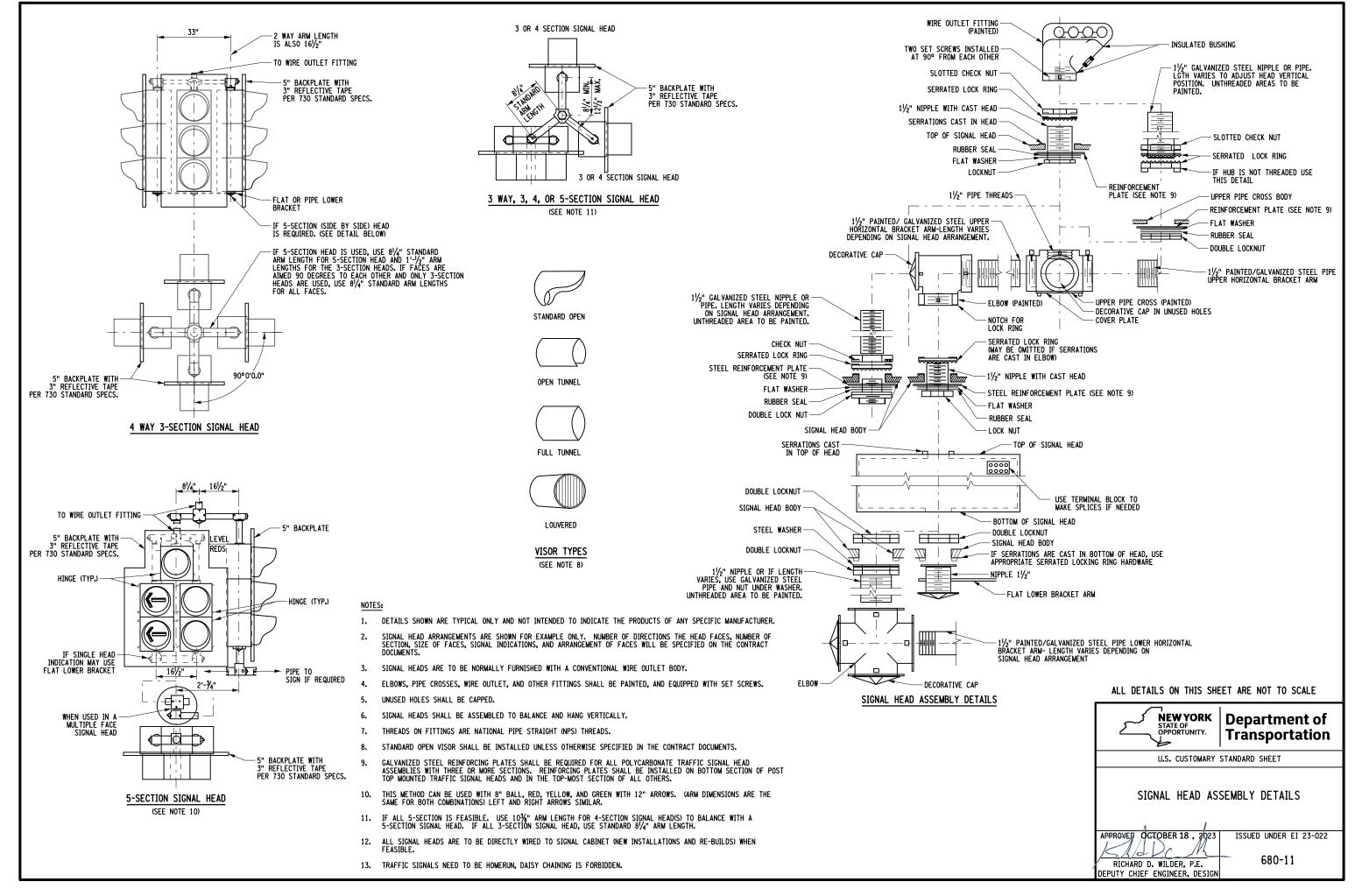
| NEW YORK STATE OF OPPORTUNITY. Department of Transportation |
|--|
| U.S. CUSTOMARY STANDARD SHEET |
| STANDARD TRAFFIC SIGNAL POLES |
| APPROVED OCTOBER 18, 2023 ISSUED UNDER EI 23-022 RICHARD D. WILDER, P.E. DEPUTY CHIEF ENGINEER, DESIGN |

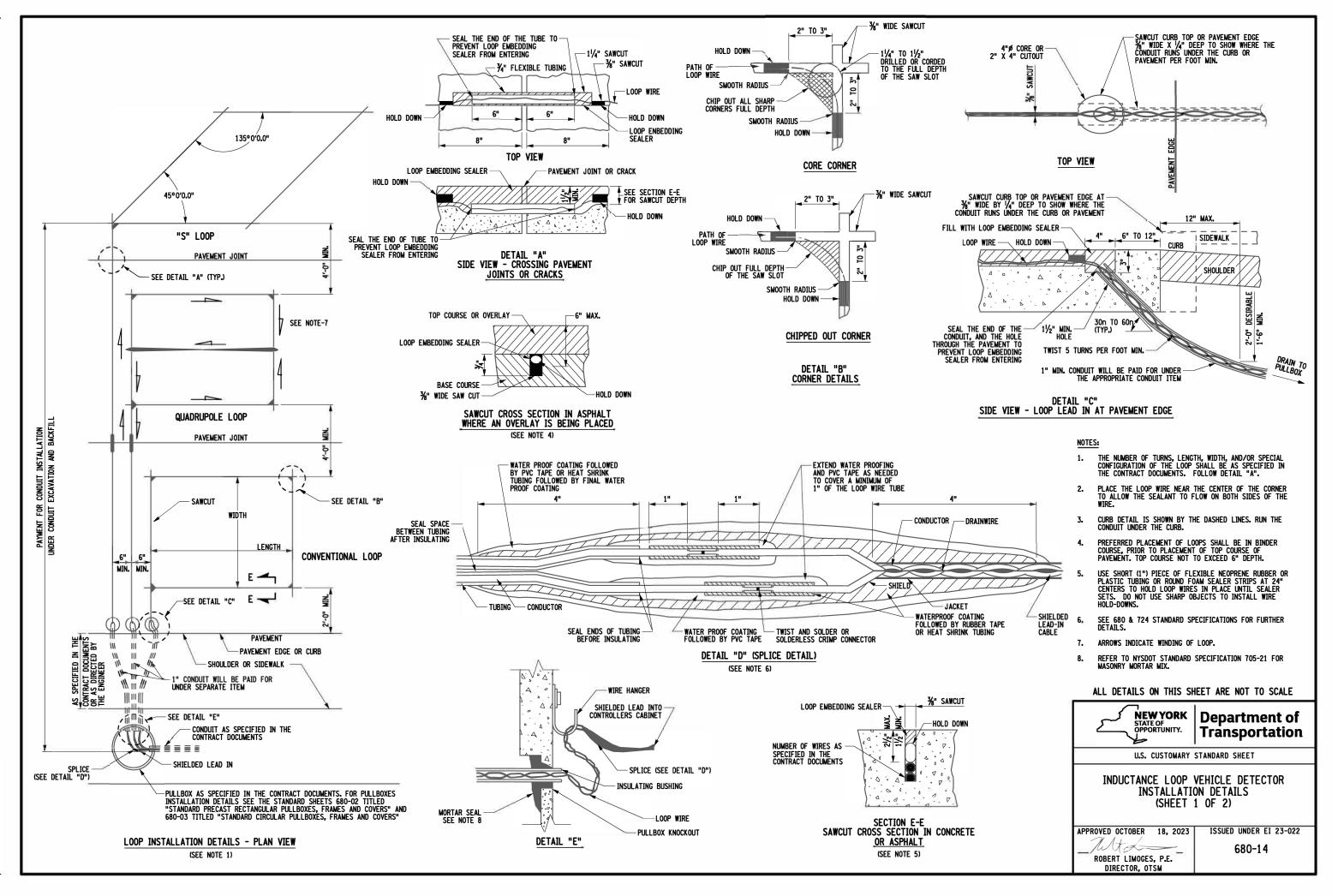


FILE NAME = 680-07.dgn DATE/TIME = 21-SEP-2023 11:20 USER = cpalaniappan

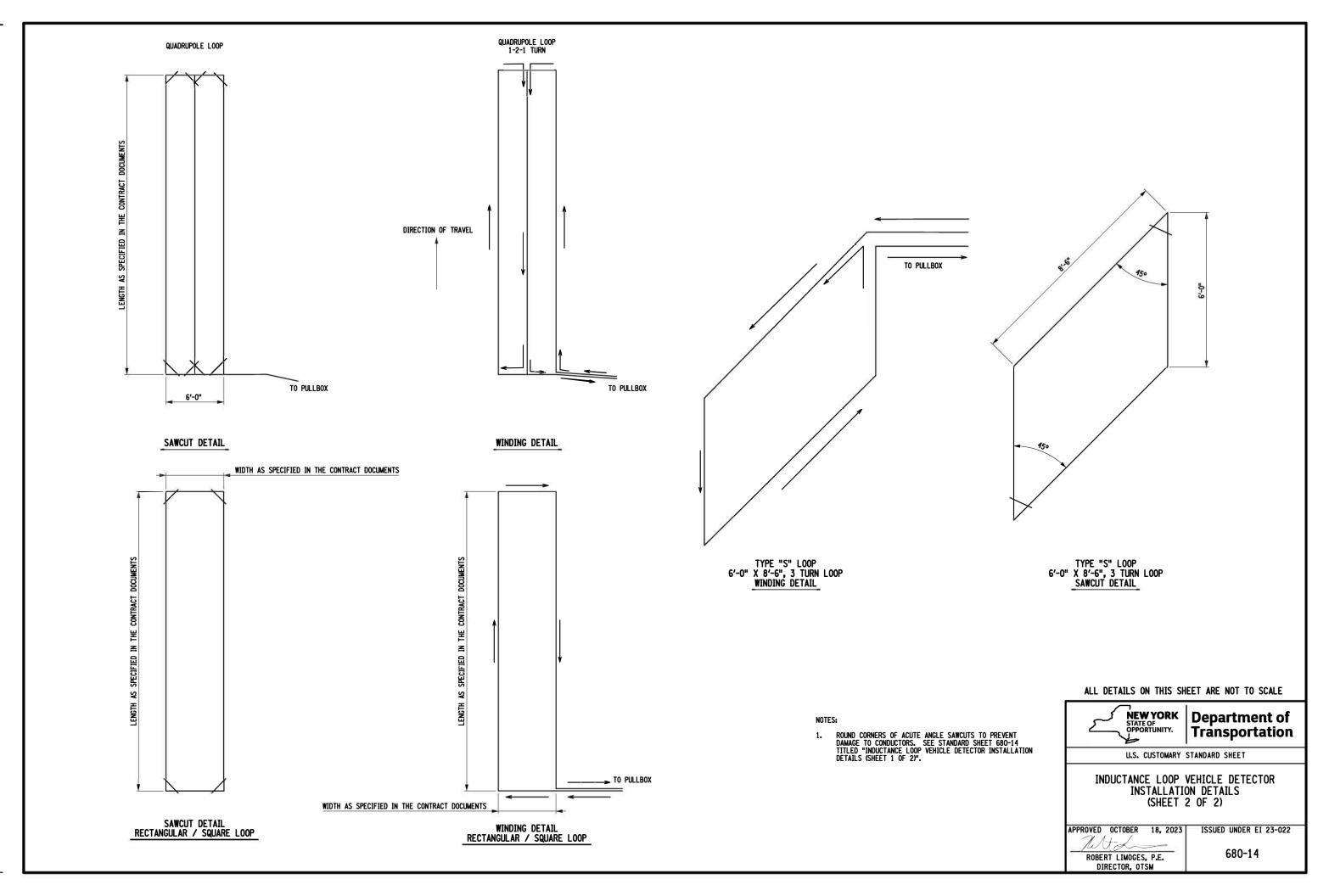
| 8. SEE STANDARD SHEET 680-08 TITLED "MAST ARM AND POLE MOUNTED TRAFFI CSIGNAL INSTALLATION DETAILS" AND POLE SHOP DRAWINGS FOR DETAILS. 9. CIRCUMFERENTIAL POLE CLAMPS, AS AN ALTERNATE TO GALVANIZED THIMBLE EYEBOLTS, ARE USED TO CONNECT SPAN WIRE(S) TO THE TOPS OF POLYGONAL SHAPED SIGNAL POLES. HOWEVER, ONLY GALVANIZED THIMBLE EYEBOLTS SHALL BE USED FOR CONNECTING SPAN WIRE(S) TO THE TOPS OF POLYGONAL SHAPED SIGNAL POLES. IN EITHER CASE, THE DESIGN LOAD OF THE CONNECTING HARDWARE SHALL BE CERTIFIED TO BE NO MORE THAN TOZ OF ITS YIELD STRENGTH. 10. ALL POLE WELDS SHALL BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL. 11. ALL POLE WELDS SHALL BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL. 12. REINFORCING BAND ARDURAD SHEET ALL DETAILS ON THIS SHEET ARE NOT TO SCALE 9. STEEL TIGHTLY ETHER WIRE 9. STEEL TIGHTLY /ul> | WIRE N DETAIL | NOTES | <u>.</u> | | | | | |
|--|--|--|--|-------------------------------------|---|---|--|----------------------------------|
| SAAN NIRE POLES SHALL BE ADJUSTED BY USE OF THE NUTE ON THE SHOULD BE OF THE NUTE ON THE SHOULD BE OF THE NUTE ON THE POLE TO SHE OF THE POLE THE POLE STATE OF THE POLE AS OF TH | | 1. | THE RED INDICATION OF THE SIGNAL HEADS ON EACH APPROACH | | | | | |
| ALL SIGNAL HEADS SHALL BE TETHERED WHEN DUAL SPAN WIRES ARE USED. ALL OPTICLEY PROGRAMMED SIGNAL HEADS SHALL BE TETHERE WIRE INSTALLATION WITH LOWER UPPER CLEARANCE LIATURY OF IT-0° AS POSSIBLE. CUIDELINES THEY SHOULD BE INSTALLED AS REAR TO THE UPPER CLEARANCE LIATURY OF IT-0° AS POSSIBLE. CUIDELINES FOR POLE AND ORSITUCTION LATERAL CLEARANCE: A ON EXPRESSMAYS OR IN RURAL AREAS OBSERVE THE FASIBLE. CUIDELINES FOR POLE AND ORSITUCTION LATERAL CLEARANCE: A ON EXPRESSMAYS OR IN RURAL AREAS OBSERVE THE FOLSES OF TRANEL LOWER ECOSEST END OF THE SIGNAL HEAD POLE CLAMP TURBBUCKLE PEDESTRIAN INFORMATION SIGN TURBBUCKLE PEDESTRIAN INFORMATION SIGN STEMENTON SIGN STEMENT | — SPAN WIRE | 2. | ANCHOR BOLTS SO THAT THEY ARE VERTICAL WHEN ALL SIGNAL HEADS AND SIGNS HAVE BEEN INSTALLED. A POLE RAKE OF ONE HALF OF DESIGN LOAD DEFLECTION, SET WHEN THE POLE | | | | WHEN ALL SIGNAL POLE RAKE OF WHEN THE POLE | |
| TURNBUCKLE PEDESTRIAN HEG MASHA WERE AND REALATION WITH LOWER TURNBUCKLE PEDESTRIAN HEG MASHA SIGNA SI | - | 3. | ALL S | IGNAL | HEADS | | | |
| S. GUDELINES FOR POLE AND OBSTRUCTION LATERAL CLEARANCE: A. DIN EXPRESSIONAL DELARA AREA RELATIONSHIP WHERE FEASIBLE. A. DIN EXPRESSIONAL DELARA AREA RELATIONSHIP WHERE FEASIBLE. DESIGN SPEED POLE CLAMP POLE CLAMP TURNBUCKLE POLE CLAMP TURNBUCKLE DESIGN SPEED TURNBUCKLE DEDESTRUATION SIGN TURNBUCKLE DEDESTRUATION SIGN DEDESTRUATION SIGN TURNBUCKLE DESIGN SPEED TURNBUCKLE DESIGN SPEED TURNBUCKLE DESIGN SPEED THAN THE LIAR WHERE NECESSAW, THE CLEARANCES IN S.C. MAY BE ALLOWED. TURNBUCKLE DESIGN SPEED THAN THE LIAR OF AND/OR RECONSTRUCTION OF EXISTING ATTERNAS, ADMERE TO THE REQUIRENTS IN BE ALLOWED. TURNBUCKLE DEDESTRUATION SIGN TURNBUCKLE DEDESTRUATION SIGN TURNBUCKLE DESIGN SPEED THAN THE LIAR MEES IN S.C. MAY BE ALLOWED. TURNBUCKLE DEDESTRUATION SIGN TURNBUCKLE DESIGN SPEED THAN THE LIAR MEES IN S.C. MAY BE ALLOWED. TURNBUCKLE DEDESTRUATION SIGN TURNBUCKLE DEDESTRUATION SIGN TURNBUCKLE DESTING THE THE THE THENE THE THE THE THE THE THE THE THE THE TH | | 4. | TETHE | RED U: R WIRE | SING DU. E. THEY | AL SPAN WI ' Should B | RE INSTALLATI E INSTALLED A | ON WITH LOWER S NEAR TO THE |
| ATTACH TETHER WIRE CLAMP SO THAT ETHER WIRE RISK LEVEL MOROSS THE ADDA THE SIGNAL HEAD FOLLOWING ROADSIDE CLEAR AREA RELATIONSHIP WHERE FATANE LEVEL MOROSS THE ADDA THE SIGNAL HEAD POLE CLAMP 50 MPH 25 FEET 10 THE POLE NOT WORE CLOSEST FOR DO & THE SIGNAL HEAD 50 MPH 25 FEET 9 MPH 20 FEET 50 MPH 25 FEET 10 MPH 25 FEET 30 MPH 25 FEET 10 MPH 25 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MPH 26 FEET 30 MPH 26 FEET 10 MER PARKING INC ARLEARAL AREA RELATIONSHIP WHERE 50 MPH 26 FEET 10 MER PREAMED IN THE PEDESTRIAN POLE CLAMP 6. FITTINDS, EXCEPT 'S HOOK''ON TETHER WIRES SO THE FEMENTIAL POLE 10 MIL CLEARD THE POLE TON THE FELD POLE TON THE FELD POLE TON THE FELD POLE TON THE FELD POLE TON THE FELD POLE TON THE FELD POLE TON THE FELD POLE TON THE FELD POLE | | 5. | GUIDEI | INES. | FOR POL | E AND OBS | TRUCTION LATE | RAL CLEARANCE: |
| CLAMP SO THAT TETHER WIRE REASS THE SIGNALS AND SIGNAND CLAMPS TO THE POLE KUMME CLOSEST FOR OF THE SIGNAL HEAD DESIGN SPEED ROADSIDE CLEAR AREA FROM EDGE OF TRAVEL LAWE SO MPH CLOSEST FOR OF THE SIGNAL HEAD SO MPH SIGNAL HEAD SO MPH SIGNAL HEAD SO MPH SIGNAL HEAD POLE CLAMP SO MPH SIGNAL HEAD SO MPH SIGNAL HEAD SO MPH SIGNAL HEAD SO MPH SIGNAL HEAD POLE CLAMP SO MPH SIGNAL HEAD POLE CLAMP SO MPH SIGNAL SO MPH SIGNAL HEAD SIGNAL HEAD FILE POLE CLAMP SO MPH SIGNAL HEAD | - ATTACH TETHER WIRE | | | FOLLO | WING RO | | | |
| THE POLE NOT MORE CLOSEST END OF THE SIGNAL HEAD 30 MPH 30 FEET 20 FEET SIGNAL HEAD NW MY 20 FEET POLE CLAMP NW MY 20 FEET TURNBUCKLE POLE CLAMP S. WHERE MERSSARY, THE CLEARANCES IN S.C. MAY BE ALLOWED. TURNBUCKLE PERSTRIAN INFORMATION SIGN S. WHERE MERSSARY, THE CLEARANCES IN S.C. MAY BE ALLOWED. PEDESTRIAN INFORMATION SIGN FITTINSS, EXCEPT 'S HOW.'O LIST THE SOLUTION OF CLESS SHOULD BE LOCATED NO CLOSEN IN THE OWED DATA HER ADAWAY OF CLESS SHOULD BE LOCATED NO CLOSEN IN THE DWEDDAT HER ADAWAY OF CLESS SHOULD BE LOCATED. STATEMENT AND THE FOLLOWING THE FOLLOWING THE SOLUTION OF CLUCLATED BY THE CONTRACTOR. PULE STATE STEELET HER WIRES SHALL DEVELOP THE FULL BEAKING STEELET HER WIRES SHALL DEVELOP THE FULL BEAKING STEELET AND AND THE FOLLOWING THE FOLLOWING THE FOLLOWING THE FOLLOWING STEELET HER WIRES SHALL DEVELOP THE FULL BEAKING STEELET AND THE CONTRACTOR. POLE FOUNDATION STEELET STATE SALECTED FROM THE CONTRACTOR. SALECTED FROM THE CONTRACTOR. POLE FOUNDATION STEELET THE TO THE SOLUTION THE FOLLOWING THE FOL | CLAMP SO THAT TETHER WIRE RUNS LEVEL ACROSS THE SIGNALS | | DESIG | n spee | ED | | | |
| B. IN NEW ARTERIALS OR MAJOR RECONSTRUCTION OF POLE CLAMP OLE CLAMP TURNBUCKLE POLE CLAMP TURNBUCKLE POLE STRIAM SIGN SIGNN S | TO THE POLE NOT MORE Than 1'-0" below the Closest end of the | | 40 MP | H | | 25 FEI | ET | |
| TURNBUCKLE SHOULD BE LOCATED NO CLÓSER TO THE SHOULDER OR UNED TATE AREA AND IN NO CASE LESS THAN 2"-O" FROM THE ROADWAY OF CUBB. PODESTRIAN INFORMATION SIGN FITTINES, EXCEPT "S HOOK" ON TETHER WIRES, USED WITH SPAN AND TETHER WIRES SPAN WIRE MAKETER SHALL BE SELECTED FROM THE FOLLOWING TABLE BASED ON THE POLE DESIGN WIRE SPAN WIRE DIAMETER SHALL BE SELECTED FROM THE FOLLOWING TABLE BASED ON THE POLE DESIGN WIRE SPAN WIRE TETHER WIRE BEAKING UAD DIA, STRENGTH UABSJUELT INFORMATION SIGN FITTINES, EXCEPT "S HOOK" ON TETHER WIRES, USED WITH SPAN AND TETHER WIRES SPAN WIRE TETHER WIRE WIRE DESIGN WIRE SPAN WIRE TETHER WIRE BEAKING UAD DIA, STRENGTH UABSJUELT INFORMATION SIGN STAN WIRE MEANING WIRE SPAN WIRE TETHER WIRE WIRE BEAKING UAD DIA, STRENGTH UABSJUELT INFORMATION SIGN SIGN WIRE SPAN WIRE TETHER WIRE WIRE DESIGN WIRE SPAN WIRE THE SPAN WIRE BEALUMENTS OR CALCULATED DY THE CONTRACTOR. POLE FOUNDATION DEE SIGN WIRE MOUNTING HEICHT MAY BE ADJUSTED IN THE FIELD TO THE ALLOWABLE CLEARANCE AND 5% MINIMUM SAG, PROVIDED THE DISTANCE BENEWENT TES SPAN WIRE ATTACHMENT POINT AND THE TOR THE FOLLO THAN THE ATTACHMENT POINT AND THE TOR THE FILL DO THE ADJUSTED IN THE FIELD TO THE ALLOWABLE CLEARANCE AND 5% MINIMUM SAG, PROVIDED THE DISTANCE BENEWEN THE STAN AND POLE MOUNTED TRAFFIC SIGNAL THAN THE ATTACHMENT POINT AND THE TORS FOR DETAILS ON THIS SHEET THE AND POLE SHOW DRAWINGE STO THE TOD'S CALLE POLE SHOW DRAWINGE STAN WIRE MOUNTED TRAFFIC SIGNAL POLES. NAL POLE SEE STAN 1/4" THICKNESS, BAND TO BE OF SAME MERLA AS POLE. OF SAME MERLA AS POLE. WIRES SHOW DAY AND THE CLEARANCE SAN WIRE MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS | < | | В. | EXISTI 5.A. W | ING ARTI HERE NE | ERIALS, ADH | IERE TO THE R | EQUIRMENTS IN |
| INCOMMENTION INCOMMENTION INCOMMENTION 6. FIGHT ME REACHED FIGHT ME THE READ OF USED INCOMMENTION 6. FIGHT ME THE READ OF THE WIRE SAMUL DEVELOP THE FULL BREAKING STREATH OF THE WIRE SAMUL DEVELOP THE FULL BREAKING STREATH OF THE WIRE SAMUL DEVELOP THE FULL BREAKING STREATH OF THE WIRE SAMUL DEVELOP THE FULL BREAKING STREATH OF THE WIRE SPAN WIRE TETHER WIRE BREAKING CALCULATED BY THE CONTRACTOR. POLE STREATH POLE FOUNTION POLE STREATH POLE FOUNTION POLE FOUNTION POLE FOUNTION POLE FOUNTION POLE FOUNTION POLE | | | С. | SHOUL CURB IMMED | D BE LO THAN TH IATE AR | ICATED NO IE LINE OF EA AND IN | CLOSER TO THE FIXED OBJECTS NO CASE LESS | SHOULDER OR S IN THE |
| SELECTED FROM THE FOLLOWING TABLE BASED ON THE POLE DESIGN LOAD SHOWN IN THE CONTRACTOR. POLE SPAN SPAN WIRE TETHER WIRE BREAKING DIA. STRENGTH DIA. ST | INFORMATION | 6. | SPAN | IGS, EX AND TI | KCEPT " | S HOOK" ON IRES SHALL | TETHER WIRES | FULL BREAKING |
| Image: Stress of the state | | | SELEC | TED FI | Rom the) shown | FOLLOWING | G TABLE BASED NTRACT DOCUME | ON THE POLE |
| Image: Side Side Side Side Side Side Side Side | 10 4'-0" DARD SHEET ITLED SIGNAL AN SIGNAL FION DETAILS | | DESIGI LOAD | 1 | WIRE DIA. | BREAKING STRENGTH | WIRE DIA. | BREAKING STRENGTH |
| TO THE ALLOWABLE CLEARANCE AND 5% MINUM SAG, PROVIDED THE DISTANCE GETWEEN THE SPAN WIRE ATTACHMENT POINT AND THE TOP OF THE POLE IS NOT LESS THAN 18". SEE STANDARD SHEET 680-08 TITLED "MAST ARM AND POLE MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS" AND POLE SHOP DRAWINGS FOR DETAILS. NAL POLE MAL POLE MIN. (SEE NOTE 7) MIN. (SEE NOTE 7) THRU BOLT THRU BOLT THRU BOLT THRU BOLT TURUE THRU BOLT TURUE THRU BOLT DUBLE NUT TURUE TURUE THRU BOLT TURUE THRU BOLT TURUE TURUE THRU BOLT TURUE TURUE THRU BOLT TURUE | are and a standard and a standard a see standard a see standard a see standard a see see | | 13,700 |) | 7/16 9/16 5/8 | 20,500 24,650 | 5/16 5/16 3/8 3/8 | 9,190 13,900 |
| 8. SEE STANDARD SHEET 680-08 TITLED "MAST ARM AND POLE MOUNTED TRAFFI CSIGNAL INSTALLATION DETAILS" AND POLE SHOP DRAWINGS FOR DETAILS. 9. CIRCUMFERENTIAL POLE CLAMPS, AS AN ALTERNATE TO GALVANIZED THIMBLE EYEBOLTS, ARE USED TO CONNECT SPAN WIRE(S) TO THE TOPS OF POLYGONAL SHAPED SIGNAL POLES. HOWEVER, ONLY GALVANIZED THIMBLE EYEBOLTS SHALL BE USED FOR CONNECTING SPAN WIRE(S) TO THE TOPS OF POLYGONAL SHAPED SIGNAL POLES. IN EITHER CASE, THE DESIGN LOAD OF THE CONNECTING HARDWARE SHALL BE CERTIFIED TO BE NO MORE THAN TOZ OF ITS YIELD STRENGTH. 10. ALL POLE WELDS SHALL BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL. 11. ALL POLE WELDS SHALL BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL. 12. REINFORCING BAND ARDURAD SHEET ALL DETAILS ON THIS SHEET ARE NOT TO SCALE 9. STEEL TIGHTLY ETHER WIRE 9. STEEL TIGHTLY /ul> | POLE FOUNDATION | 7. | TO TH THE D | E ALLI ISTANO | OWABLE CE BETW | CLEARANCE EEN THE SF | AND 5% MINIMU PAN WIRE ATTAC | JM SAG, PROVIDED CHMENT POINT |
| MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) MIN. (SEE NOTE T) ALL POLE WELDS SHALL BE IN ACCORDANCE WITH NYS STEEL CONSTRUCTION MANUAL. ALL DETAILS ON THIS SHEET ARE NOT TO SCALE MIN. (SEE NOTE T) MANUFACTURER P STEEL TIGHTLY MANUFACTURER P STEEL TIGHTLY MIRE MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS MIN. (SEE NOTE T) | DLE | 8. | MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS" AND POLE | | | | | |
| - THRU BOLT - DUBLE NUT - CURVED WASHER - 12" REINFORCING BAND AROUND EYEBOLT FOR POLES THAN 1/4" THICKNESS, BAND TO BE OF SAME METAL AS POLE, WELD AS DETERMINED BY MANUFACTURER P STEEL TIGHTLY ETHER WIRE | •••••••••••••••••••••••••••••••••••••• | 9. | HOWEV USED IN EIT HARDW | ER, ON FOR CI HER C ARE SI | NLY GAL' ONNECTI ASE, TH HALL BE | VANIZED TH NG SPAN WI E DESIGN L CERTIFIED | (MBLE EYEBOLT RF(S) TO ROUND | S SHALL BE STGNAL POLES |
| - CURVED WASHER - 12" REINFORCING BAND AROUND EYEBOLT FOR POLES LESS THAN 1/4" THICKNESS, BAND TO BE OF SAME METAL AS POLE, WELD AS DETERMINED BY MANUFACTURER P STEEL TIGHTLY ETHER WIRE | | 10. | | | | | ACCORDANCE W | ITH NYS STEEL |
| AROUND EYEBOLT FOR POLES LESS THAN 1/4" THICKNESS, BAND TO BE OF SAME METAL AS POLE, WEANDFACTURER P STEEL TIGHTLY ETHER WIRE | | | | | | | | |
| OF SAME METAL AS POLE, WELD AS DETERMINED BY MANUFACTURER NEW YORK STATE OF OPPORTUNITY. Department of Transportation P STEEL TIGHTLY ETHER WIRE U.S. CUSTOMARY STANDARD SHEET SPAN WIRE SPAN WIRE MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS APPROVED: OCTOBER 18, 2023 ISSUED UNDER EI 23-022 RICHARD D. WILDER, P.E. 680-07 | AROUND EYEBOLT FOR POLES LESS THAN 1/4" | | ALL [| DETAI | LS ON | THIS SH | EET ARE NO | T TO SCALE |
| SPAN WIRE SPAN WIRE MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS | OF SAME METAL AS POLE, WELD AS DETERMINED BY | | ٤ | | STATE O | F | | |
| SIGNAL INSTALLATION DETAILS | | | | | U . S. CU | STOMARY S | TANDARD SHE | ET |
| RICHARD D. WILDER, P.E. 680-07 | | SPAN WIRE MOUNTED TRAFFIC SIGNAL INSTALLATION DETAILS | | | | | | |
| RICHARD D. WILDER, F.E. | | | ROVE P: | bet | OBER 1 | 8,2023 | ISSUED UN | IDER EI 23-022 |
| DEPUTY CHIEF ENGINEER, DESIGN | / | | | | | | - 68 | 30-07 |



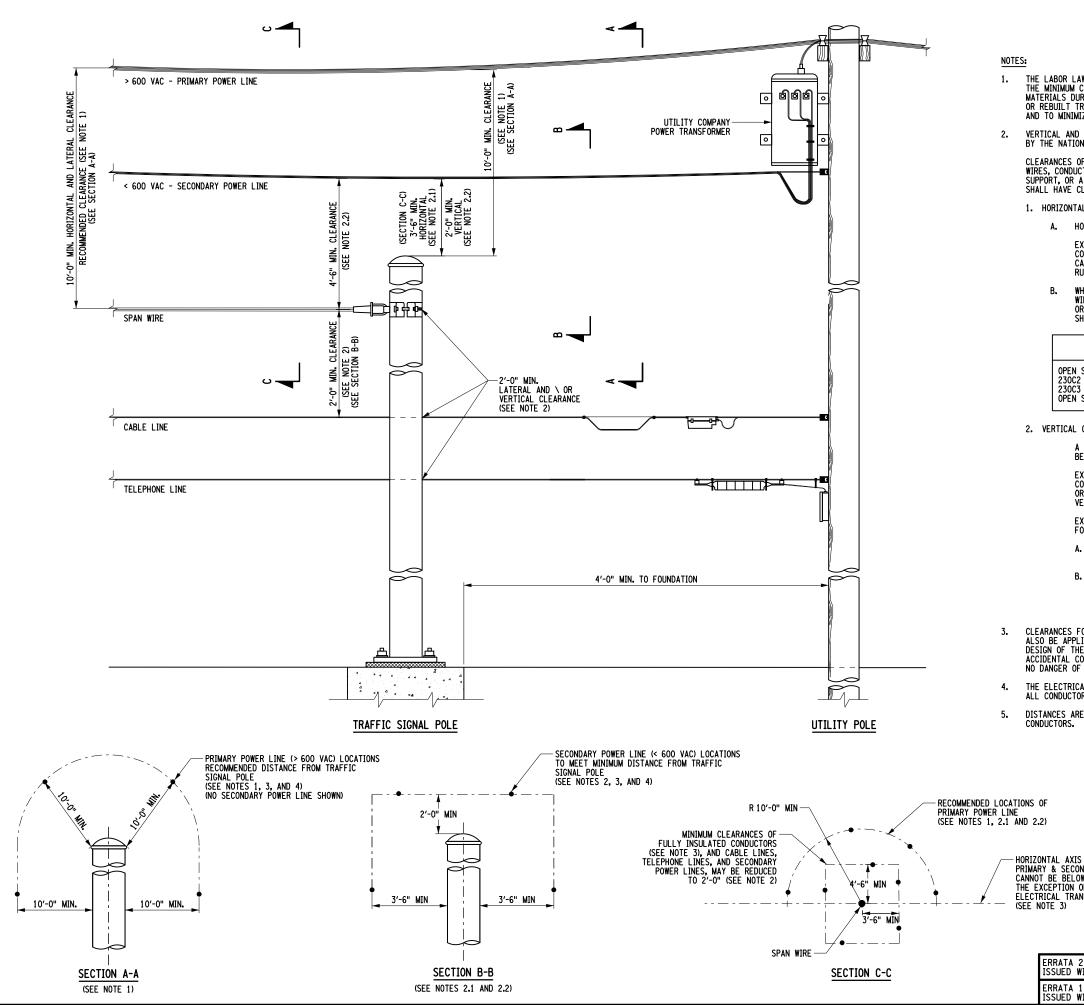




FILE NAME = 680-1401.dgn DATE/TIME = 21-SEP-2023 10:35 + USER = opalantappan



FILE NAME = 680-1402.don DATE/TIME = 21-5EP-2023 10:35 USER = opalantappan



+

THE LABOR LAW CODE RULE 57 SECTION 202-H HIGH VOLTAGE PROXIMITY ACT ESTABLISHES THE MINIMUM CLEARANCE BETWEEN ELECTRICAL CONDUCTORS AND PERSONNEL CUIPMENT MATERIALS DURING INSTALLATION. THIS CLEARANCE SHOULD BE MAINTAINED FOR ALL NEW OR REBUILT TRAFFIC SIGNAL LOCATIONS TO FACILITATE MAINTENANCE OF TRAFFIC SIGNAL EQUIPMENT AND TO MINIMIZE RISK OF ELECTROCUTION.

VERTICAL AND HORIZONTAL CLEARANCES BETWEEN WIRES\CONDUCTORS AS DETERMINED BY THE NATIONAL ELECTRICAL SAFETY CODE SECTION 234.B AS DESCRIBED BELOW:

CLEARANCES OF WIRES, CONDUCTORS, AND CABLES FROM OTHER SUPPORTING STRUCTURES-WIRES, CONDUCTORS, OR CABLES OF ONE LINE PASSING NEAR A LIGHTING SUPPORT, TRAFFIC SIGNAL SUPPORT, OR A SUPPORTING STRUCTURE OF A SECOND LINE, WITHOUT BEING ATTACHED THERETO, SHALL HAVE CLEARANCE FROM ANY PART OF A STRUCTURE NOT LESS THAN THE FOLLOWING:

1. HORIZONTAL CLEARANCES:

A. HORIZONTAL CLEARANCE, WITHOUT WIND, OF 5'-0" FOR VOLTAGES UP TO 50 KV.

EXCEPTION: FOR EFFECTIVELY GROUNDED GUYS AND MESSENGERS, INSULATED COMMUNICATIONS CONDUCTORS AND CABLES, NEUTRALS MEETING RULE 230E1, AND CABLES OF 300 V OR LESS TO GROUND MEETING THE REQUIREMENTS OF RULE 230C1, RULE 230C2, OR RULE 230C3, THE HORIZONTAL CLEARANCE MAY BE REDUCED TO 3'-O".

WHEN THE FOLLOWING CONDUCTORS AND CABLES ARE DISPLACED FROM REST UNDER WIND CONDITIONS OF RULE 234A2, HORIZONTAL CLEARANCES FROM SUCH CONDUCTORS OR CABLES TO OTHER SUPPORTING STRUCTURES SHALL BE NOT LESS THAN THOSE SHOWN BELOW:

| CONDUCTOR OR CABLE | HORIZONTAL CLEARANCE REQUIRED WHEN DISPLACED BY WIND (FT.) |
|--|---|
| PEN SUPPLY CONDUCTORS, O TO 750 V | 3.5 |
| 30C2 CABLE, ABOVE 750 V | 3.5 |
| 30C3 CABLE, ABOVE 750 V | 3.5 |
| PEN SUPPLY CONDUCTORS, OVER 750 V TO 22 KV | 4.5 |

2. VERTICAL CLEARANCES:

A VERTICAL CLEARANCE OF 4'-6" FOR VOLTAGES BELOW 22 KV AND 5'-6" FOR VOLTAGES BETWEEN 22 KV AND 50 KV. EXCEPTIONS 1 AND 2 SHALL NOT BE APPLIED CUMULATIVELY.

EXCEPTION 1: FOR EFFECTIVELY GROUNDED GUYS AND MESSENGERS, INSULATED COMMUNICATION CONDUCTORS AND CABLES, AND NEUTRALS MEETING RULE 230E1 AND FOR CABLES OF 300 V OR LESS TO GROUND MEETING THE REQUIREMENTS OF RULE 230C1, 230C2, OR 230C3, THE VERTICAL CLEARANCE MAY BE REDUCED TO 2'-O".

EXCEPTION 2: THE VERTICAL CLEARANCES MAY BE REDUCED TO 2'-0" IF BOTH OF THE FOLLOWING CONDITIONS ARE MET:

- Α. THE WIRES, CONDUCTORS, OR CABLES ABOVE THE SUPPORTING STRUCTURE OF ANOTHER LINE BELOW ARE OPERATED AND MAINTAINED BY THE SAME UTILITY.
- EMPLOYEES DO NOT WORK ABOVE THE TOP OF THE SUPPORTING STRUCTURE UNLESS:
- 1. THE UPPER CIRCUIT IS DE- ENERGIZED OR TEMPORARILY INSULATED OR REPOSITIONED, OR
- 2. OTHER EQUIVALENT MEASURES ARE TAKEN.

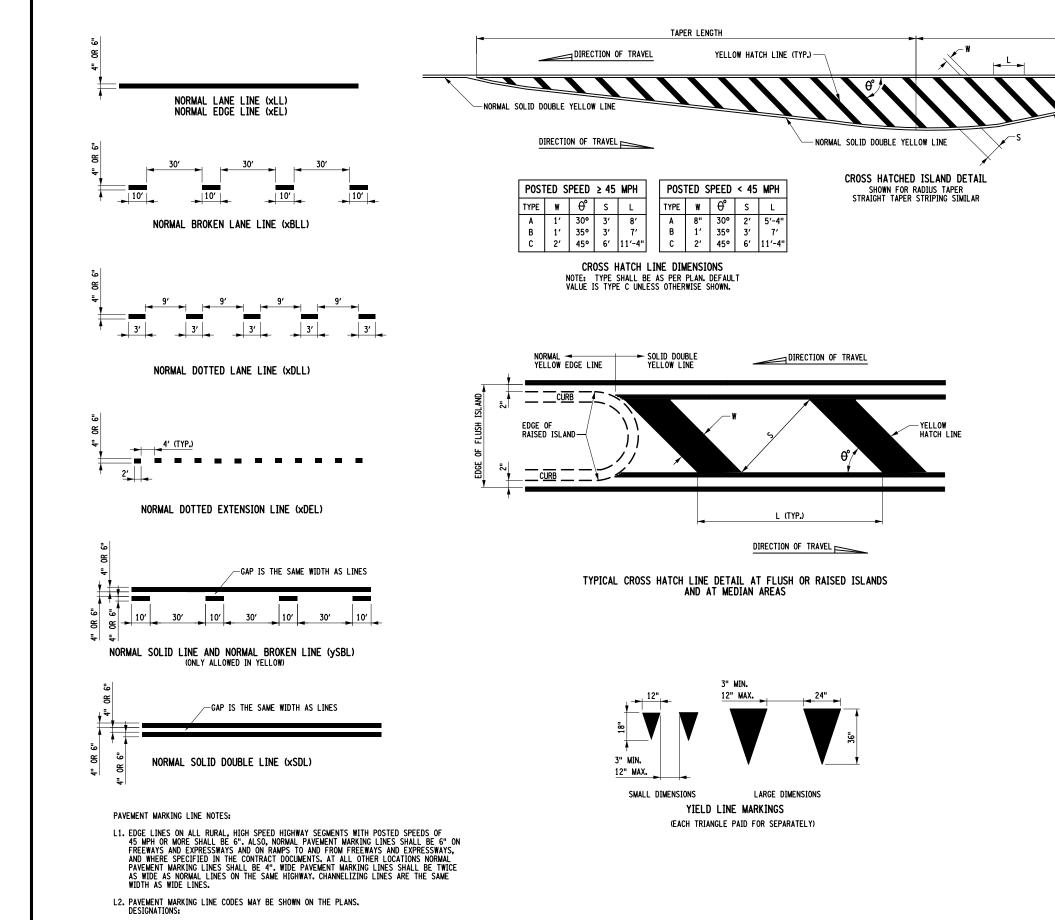
CLEARANCES FOR SECONDARY POWER LINES (< 600 VAC) AS DEFINED ON NOTE 2, CAN ALSO BE APPLIED TO FULLY INSULATED ELECTRICAL TRANSMISSION CONDUCTORS, WHICH BY DESIGN OF THEIR INSULATION SYSTEM, PRESENT NO DANGER OF ELECTRIC SHOCK IF ACCIDENTAL CONTACT IS MADE, AND IF CONDUCTORS ARE FULLY INSULATED TO PRESENT NO DANGER OF ELECTRICAL SHOCK.

THE ELECTRICAL UTILITY COMPANY SHOULD BE CONTACTED TO CONFIRM THE VOLTAGES FOR ALL CONDUCTORS IN CLOSE PROXIMITY TO TRAFFIC SIGNAL FACILITIES.

DISTANCES ARE MEASURED BASED ON THE MAXIMUM OPERATING TEMPERATURE OF THE

ALL DETAILS ON THIS SHEET ARE NOT TO SCALE

| | NEW YORK STATE Tr | epartment of ransportation | | | |
|--|---|-------------------------------|--|--|--|
| AXIS OF SPAN WIRE - ECONDARY POWER LINES | U.S. CUSTOMARY STANDARD SHEET | | | | |
| VELOW SPAN WIRE, WITH ON OF FULLY INSULATED TRANSMISSION CONDUCTORS. | UTILITY CLEARANCES TO SIGNAL POLES | | | | |
| TA 2 D WITH EB XX-XXX | APPROVED OCTOBER 18, 2023 /s/ robert limoges | ISSUED UNDER EI 23-022 | | | |
| TA 1 D WITH EB XX-XXX | ROBERT LIMOGES, P.E. DIRECTOR, OTSM | 680-16 | | | |



2023 2 May SHEETS STANDARD

> E = 685-0101_01019.dgn E = 01-0CT-2018 12:16 R = rfoote FILE NAME DATE/TIME USER

"W"=WHITE

"Y"=YELLOW

"WIDE"=WIDE

+

| TAPER LENGTH | -NORMAL YELLOW | SOLID Line | DOUBLE |
|--------------|-------------------|---------------|--------|
| | | | |

-SEE CONTRACT DOCUMENTS FOR CURVATURE OR TAPER

GENERAL PAVEMENT MARKING NOTES:

1. ALL PAVEMENT MARKINGS SHALL BE PLACED IN ACCORDANCE WITH THE MUTCH AND NYS SUPPLEMENT.

2. EDGE LINES SHALL BE YELLOW ON THE LEFT SIDE AND WHITE ON THE RIGHT SIDE IN THE DIRECTION OF TRAVEL UNLESS OTHERWISE SHOWN ON THE PLANS. IF THE CURB OFFSET IS LESS THAN 2'-O", NO EDGE LINE SHALL BE APPLIED ADJACENT TO CURBS UNLESS OTHERWISE SHOWN ON THE PLANS. EDGE LINES SHALL BE PROVIDED AT THE CURB ADJACENT TO RAISED ISLANDS (SEE DETAIL).

3. WHERE MARKINGS NORMALLY FOLLOW A PAVEMENT JOINT, SINGLE LINE MARKINGS SHALL BE PLACED ALONG ONE SIDE OF THE JOINT. DOUBLE LINE MARKINGS SHALL STRADDLE THE JOINT. LANE LINES ON ROADWAYS WHICH ARE MORE THAN TWO LANES WIDE AND HAVE LONGITUDINAL JOINTS BETWEEN ADJACENT LANES, SHALL BE PLACED ON THE SIDE OF THE JOINT WHICH WILL OBTAIN OPTIMUM LANE WIDTHS.

AT THE JUNCTION OF SINGLE AND DOUBLE LINE MARKINGS WHICH FOLLOW A PAVEMENT JOINT, THE SINGLE LINE SHALL BE AN EXTENSION OF EITHER OF THE DOUBLE LINES AND NOT THE SPACE BETWEEN THEM. AT THE JUNCTION OF SINGLE AND DOUBLE LINE MARKINGS WHICH DO NOT FOLLOW A PAVEMENT JOINT, THE SINGLE LINE MAR BE ALIGNED WITH THE CENTER OF THE DOUBLE LINE MARKING OR WITH EITHER LINE OF THE DOUBLE LINE.

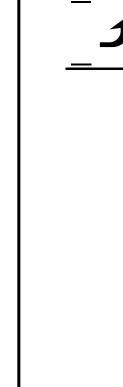
4. ALL DIMENSIONS AND THE PLACEMENT OF ARROWS, SYMBOLS, AND TEXT SHOWN ARE TYPICAL AND SHALL APPLY UNLESS OTHERWISE INDICATED IN THE CONTRACT DOCUMENTS.

5. THE REGIONAL TRAFFIC ENGINEER WILL REVIEW AND APPROVE ANY CHANGES TO THE PAVEMENT MARKING PLANS PRIOR TO FINAL INSTALLATION. CHANGES SHALL BE SUBMITTED TWO WEEKS PRIOR TO INSTALLATION.



/S/ ROBERT LIMOGES P.E. DIRECTOR, OFFICE OF TRAFFIC SAFETY AND MOBILITY

685-01



2023

2

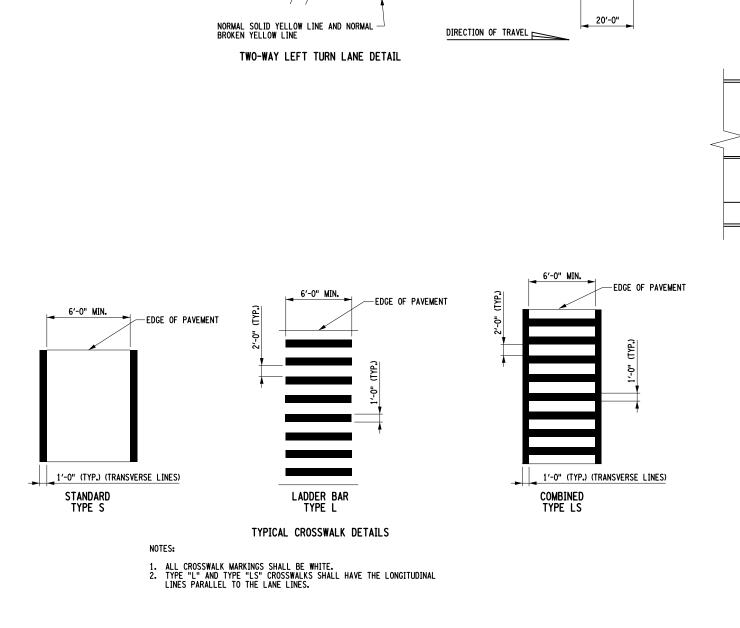
May

SHEETS

STANDARD

DIRECTION OF TRAVEL

5'-0" (TYP.)

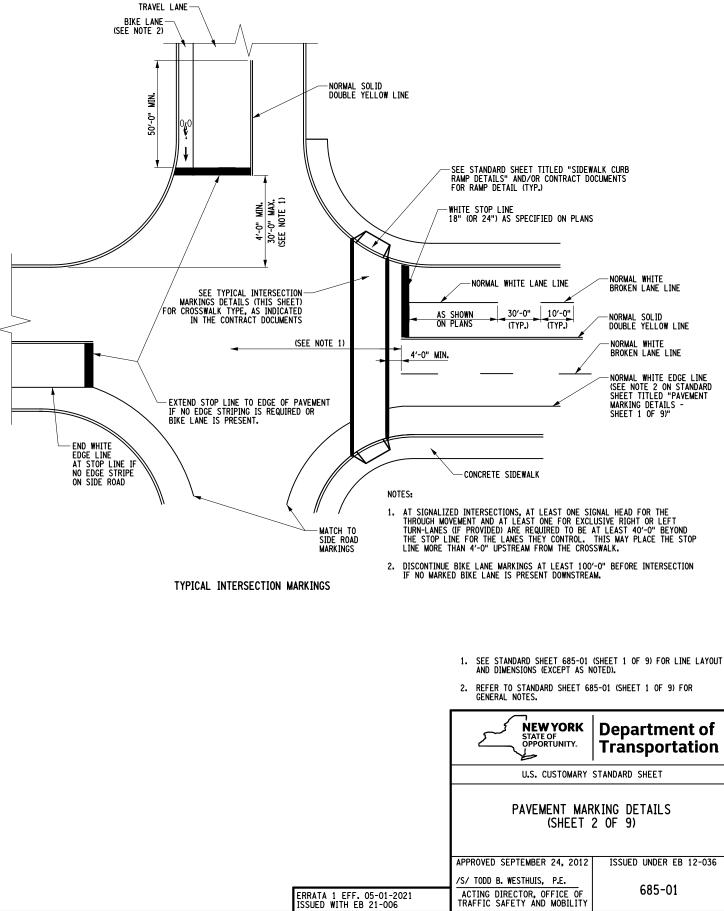


200'-0" (TYP.) OR AS SHOWN IN CONTRACT DOCUMENTS

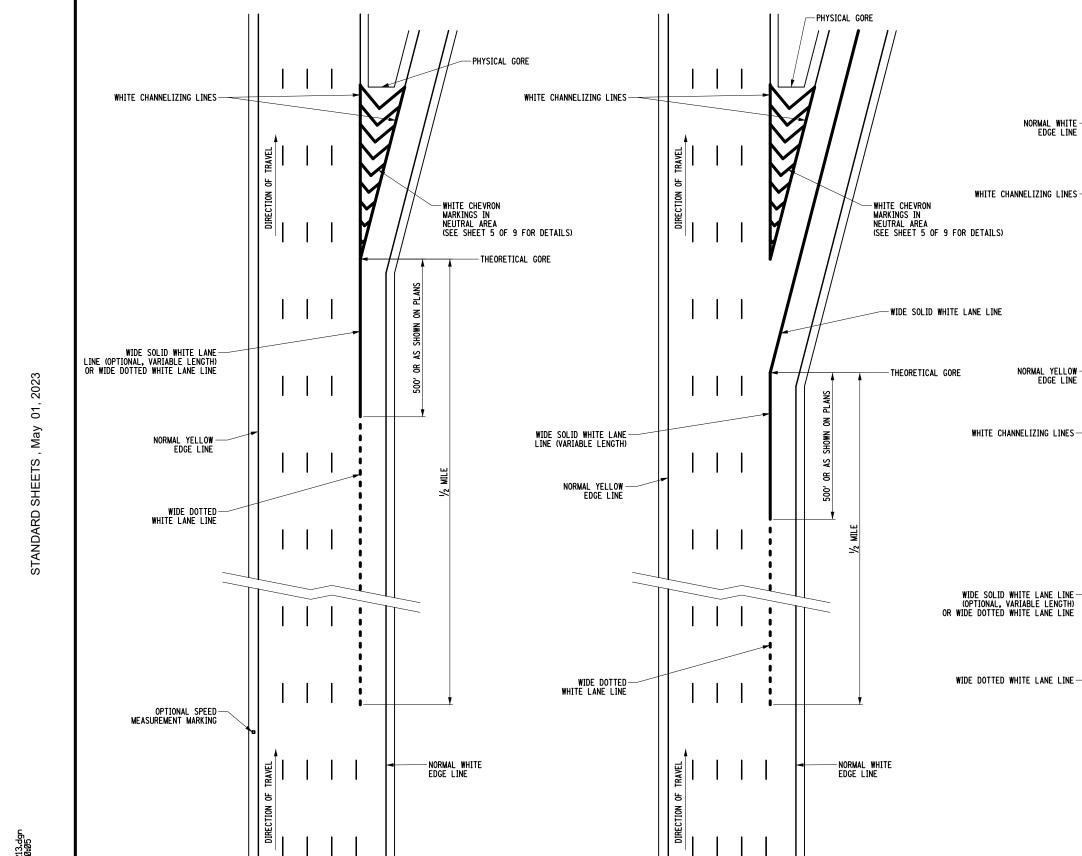
- WHITE TURNING ARROW (TYP.)

OF TWO WAY TURN LANE

START LEFT







LANE DROP AT A MULTI-LANE EXIT RAMP WITH OPTION LANE

LANE DROP AT A SINGLE LANE EXIT RAMP

TWO-LANE DROP AT AN EXIT RAMP

TRAVEL

뇽

DIRECTION

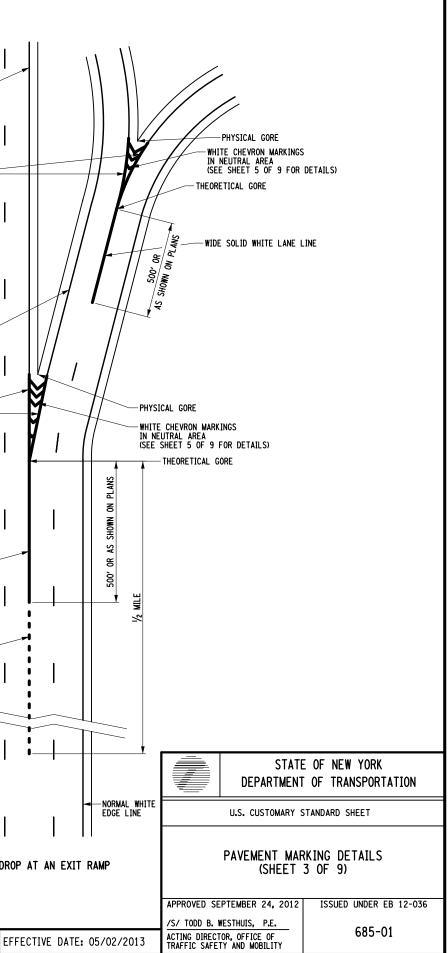
NORMAL WHITE EDGE LINE

NORMAL YELLOW -EDGE LINE

TRAVEL

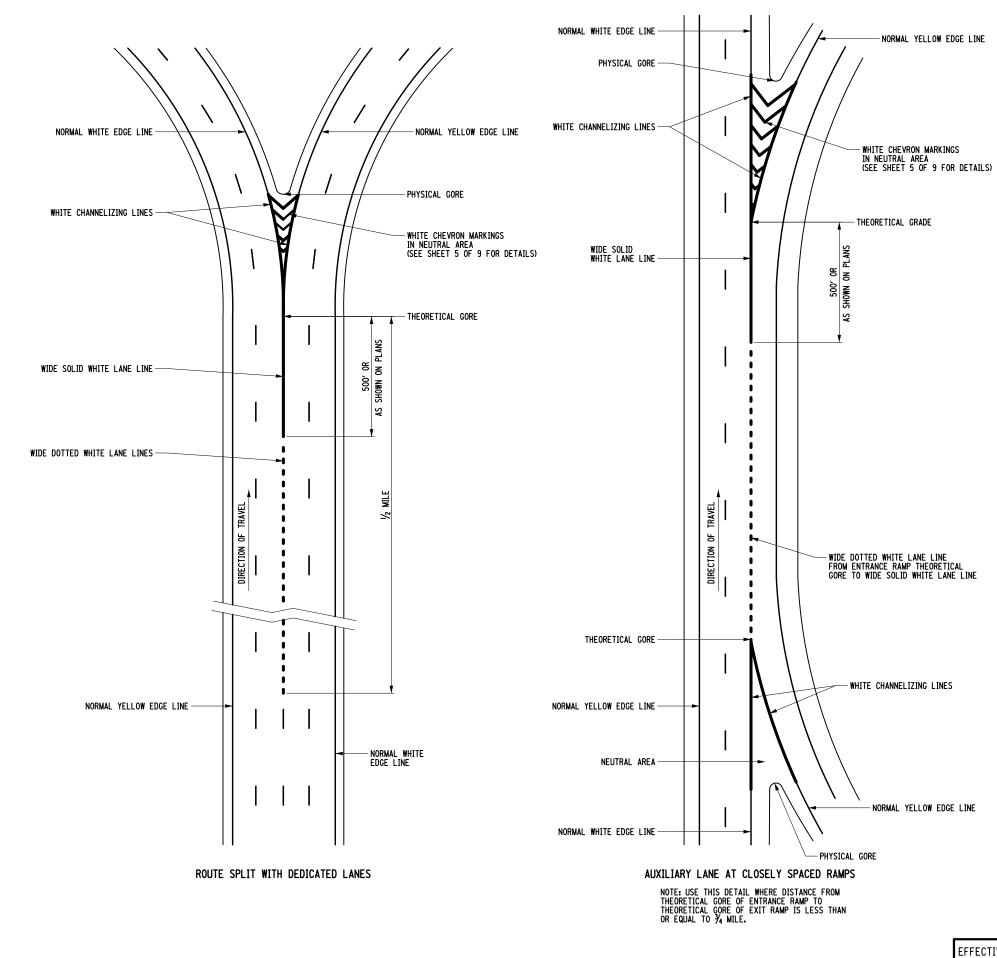
ĥ

DIRECTION

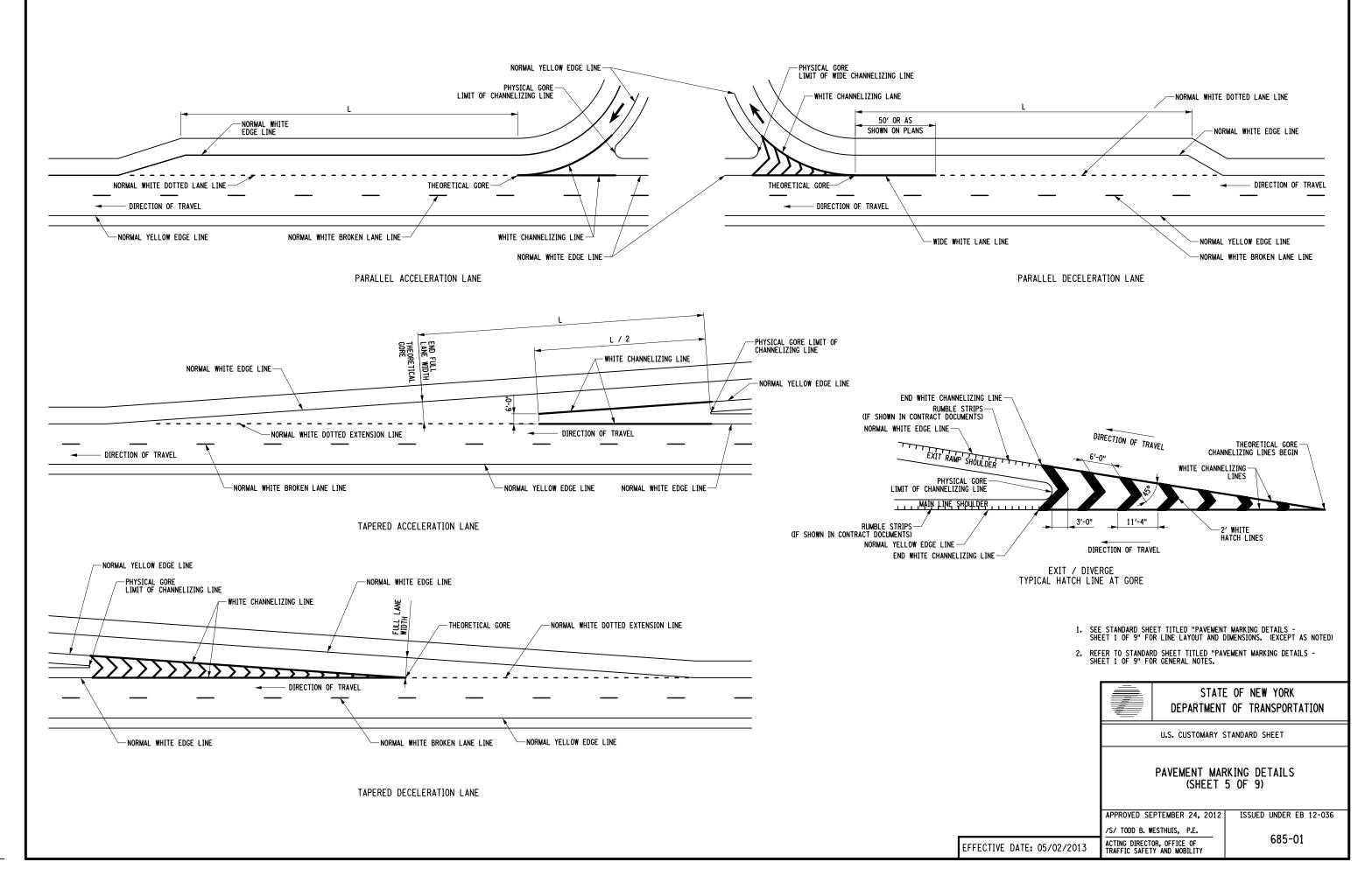


+

FILE NAME = 685-0104_050213.dgn DATE/TIME = 27-55P-2012 10:05 + +



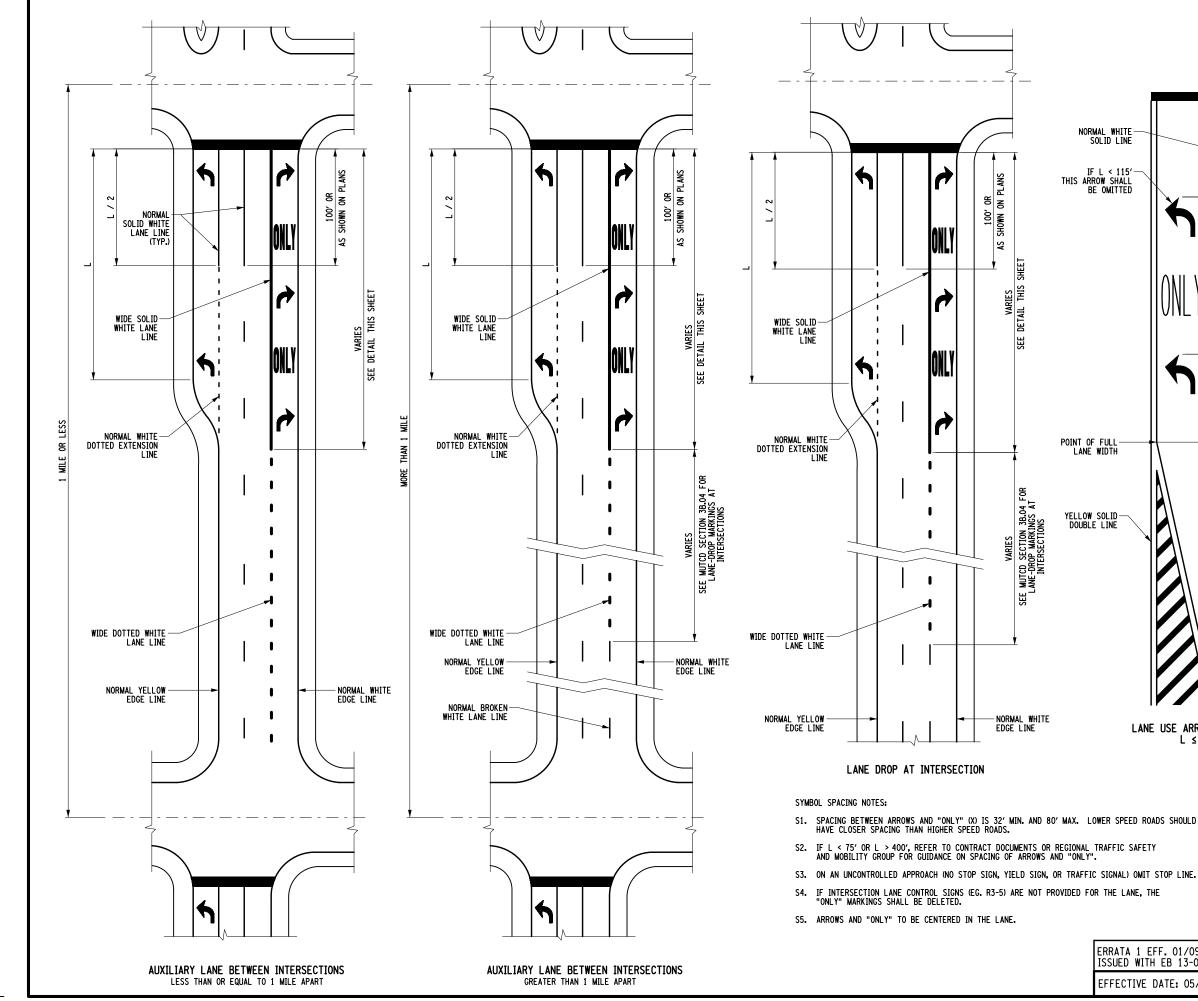
| | | STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION | | | | |
|---------------------|--|---|------------------------|--|--|--|
| | U.S. CUSTOMARY STANDARD SHEET | | | | | |
| | PAVEMENT MARKING DETAILS (SHEET 4 OF 9) | | | | | |
| | | PTEMBER 24, 2012 | ISSUED UNDER EB 12-036 | | | |
| | /S/ TODD B. N | WESTHUIS, P.E. | C95 01 | | | |
| VE DATE: 05/02/2013 | ACTING DIRECT TRAFFIC SAFE | OR, OFFICE OF TY AND MOBILITY | 685-01 | | | |

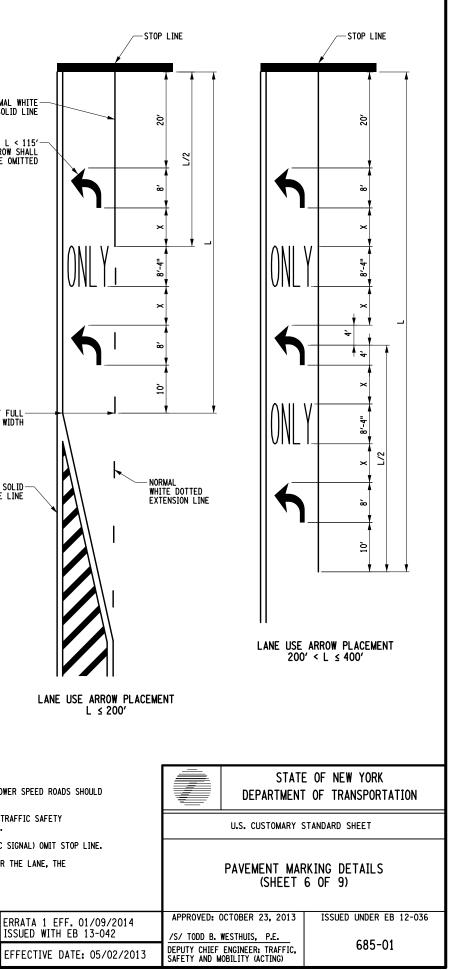


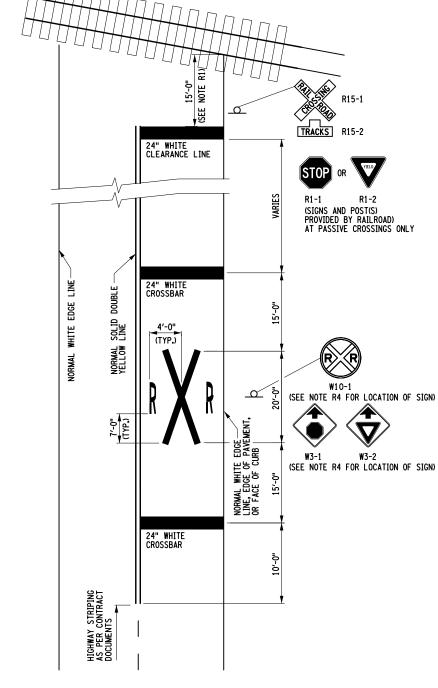
+

FILE NAME = 685-0105.050213.dgn DATE/TIME = 27-56P-2012 10:05 + USER = Jturley

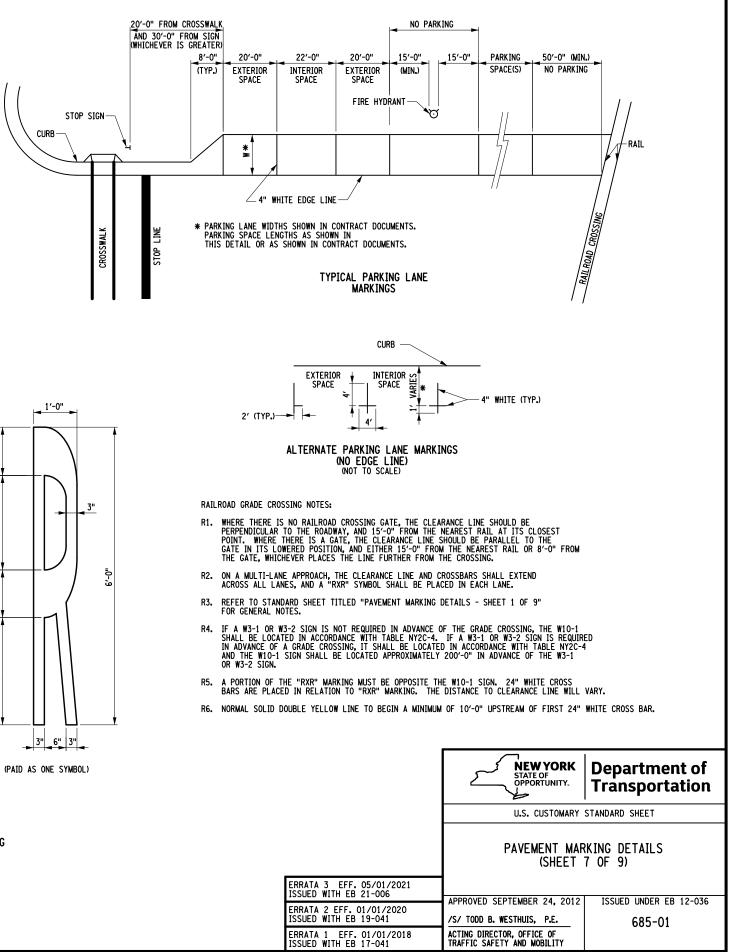
FILE NAME = 685-0106.050213ei.dgn DATE/TIME = 14-NOV-2013 09:01 + +

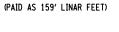






RAILROAD GRADE CROSSING MARKINGS AND LAYOUT PLAN





8'-0"

Ç

þ

ò

۰£

RAILROAD GRADE CROSSING

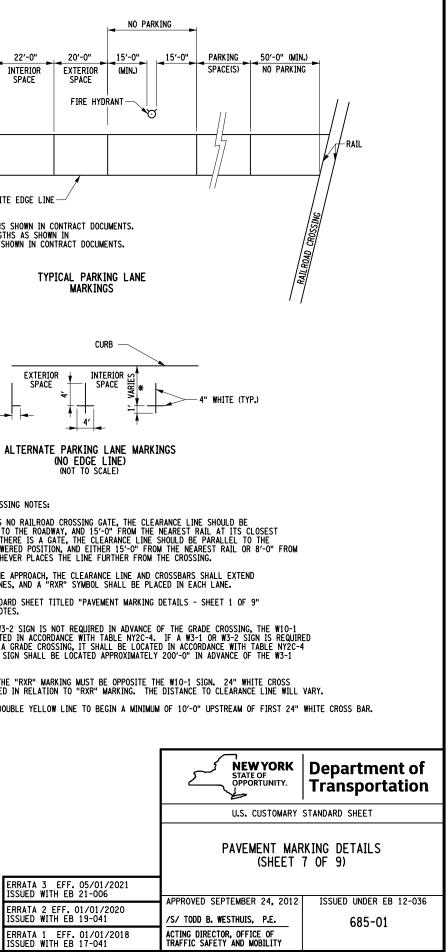
<u>ף</u>

2′-0"

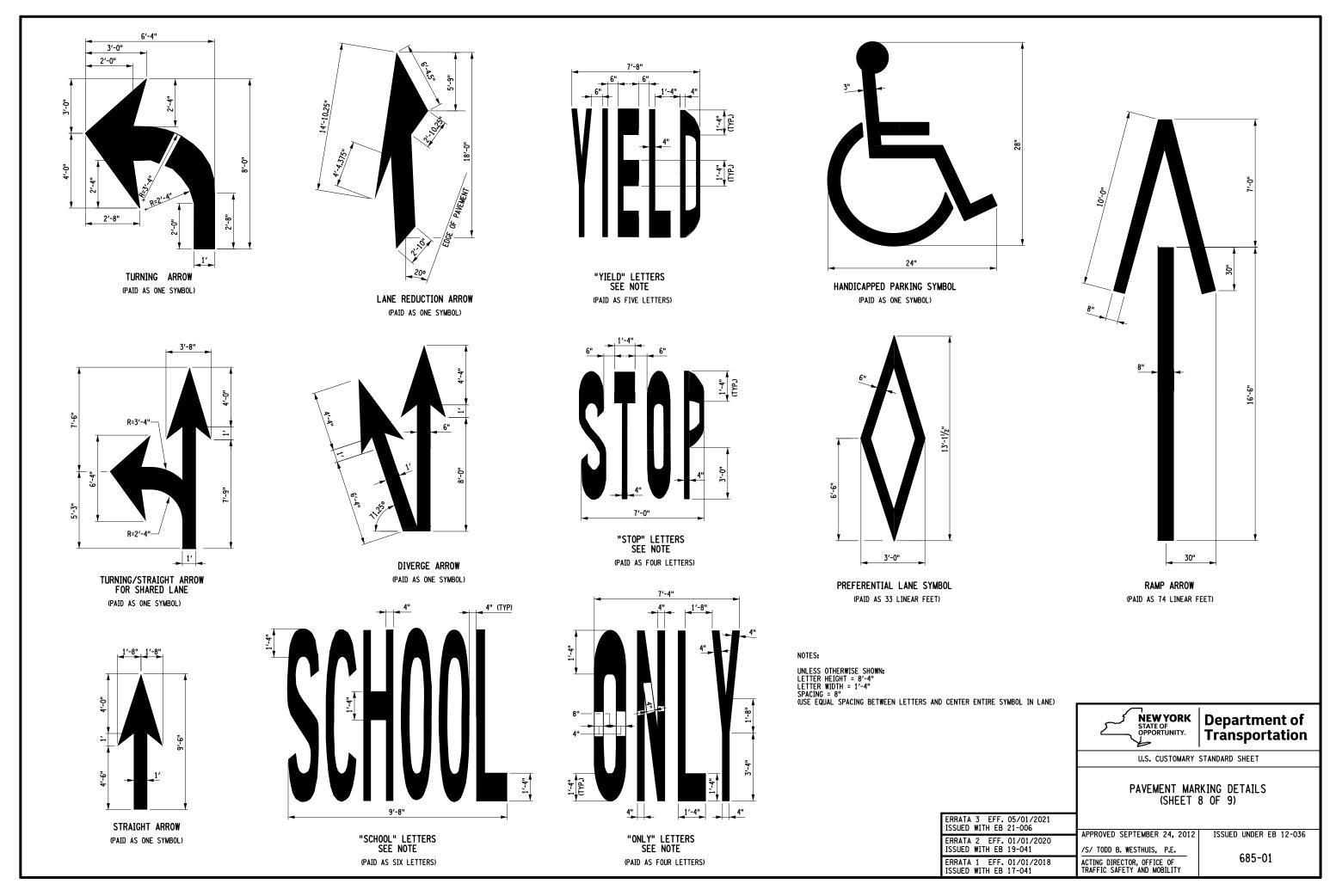
-,-

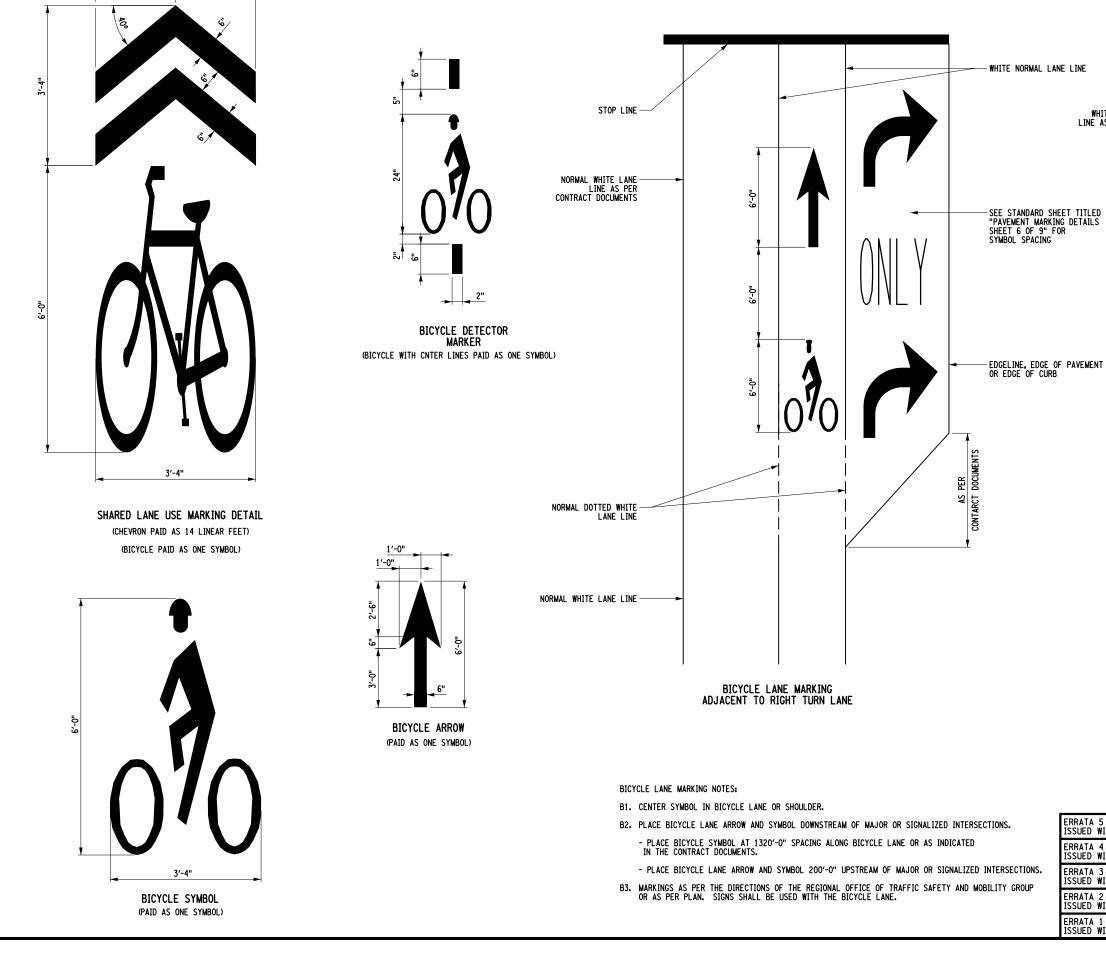
þ

Æ









1'-8"

1'-8"

